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American Fern Journal

A QUARTERLY DEVOTED TO FERNS

Published by the

AMERICAN FERN SOCIETY

EDITORS

C. A. WEATHERBY

R. C. BENEDICT W. R. MAXON

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CONTENTS

VOLUME 30, NUMBER 1, PAGES 1–40, ISSUED MARCH 27, 1940

Adventures in Fern Collecting, III ..... *E. J. Palmer* 1
Ferns of the Kilauea-Mauna Loa Section of The Hawaii National Park ..... *R. L. Fowler* 9
A New Philippine Isoetes ..... *E. D. Merrill and L. M. Perry* 18
A Station for Hymenophyllum in South Carolina ... *D. S. Correll* 21
Shorter Notes 27
Recent Fern Literature 30
American Fern Society 32

VOLUME 30, NO. 2, PAGES 41–72, ISSUED JUNE 23, 1940

Ferns in the Kutztown-Fleetwood Area, Pennsylvania. *C. L. Gruber* 41
Selaginella Rupestris in Arkansas ..... *D. M. Moore* 50
Cyrtomium in Southern California ..... *H. H. Tracy* 52
Notes on Texas Ferns ..... *H. B. Parks* 56
Recent Fern Literature 62
Shorter Notes 63
American Fern Society 68

VOLUME 30, NO. 3, PAGES 73–104, ISSUED OCTOBER 2, 1940

Ferns and Fern Allies of South Carolina ..... *V. D. Matthews* 73
Hybrid between Polystichum Braunii and P. acrostichoides. *R. H. Thompson and R. L. Coffin* 83
Ferns and Fern Allies of the Kutztown-Fleetwood Area, Pennsylvania ..... *C. L. Gruber* 89
Pilularia in Texas ..... *C. La Motte* 99
Recent Fern Literature 102
Shorter Notes 103
American Fern Society 104

VOLUME 30, NO. 4, PAGES 105–144, ISSUED JANUARY 10, 1941

Arkansas Pteridophyta ..... *D. M. Moore* 105
Ferns and Fern Allies of South Carolina ..... *V. D. Matthews* 119
A Summer in Northern Europe ..... *H. G. Rugg* 129
Recent Fern Literature 132
Shorter Notes 136
American Fern Society 138
Index to Volume 30 140

Vol. 30 January-March, 1940 No. 1

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A new Philippine Isoetes ..... E. D. Merrill and L. M. Perry 18

A Station for Hymenophyllum in South Carolina ..... D. S. Correll 21

Shorter Notes: Two Ferns new to Kentucky; Northward Extension of Range for Hypolepis repens; Fertile Scott's Spleenwort 27

Recent Fern Literature 30

American Fern Society 32

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American Fern Journal

VOL. 30 JANUARY–MARCH, 1940 NO. 1

Adventures in Fern Collecting—III

ERNEST J. PALMER

If you are interested in the study of ferns or of any other group of plants as a hobby, there are many advantages to the plan of selecting some definite local area and of concentrating on it until you become quite familiar with it and with its flora. For the amateur who has little time or opportunity for travel this plan affords the best and almost the only way of accomplishing something worthwhile and of permanent value. For if you are truly interested and inspired by a love of the work, you may well in time become an authority on the ferns or flora of your locality and may be able to make a contribution of real value to the subject.

It is almost certain, however, if you have the spirit and enthusiasm of the true botanist or naturalist, that your interests will grow and be extended in time to other groups and into wider fields. The intimate knowledge of some local area and flora will be an asset of the greatest value in carrying on such work no matter how far you go.

The unit usually chosen for exploration in the eastern states is the town, and in the West with its wider open spaces and wider ambitions, a county may be taken on. There is no rule, and since you will not be required to pay by the acre for the area you select, your own energy and opportunity for exploiting it will set the only limit to your possessions.

[Volume 29, No. 4 of the JOURNAL, pages 125–162, plates 10 and 11, was issued Jan. 19, 1940.]

After selecting an area you will soon begin to feel a sort of proprietorship in it. Your interest in it is a very real and indisputable one so far as enjoying the fruits of your quest are concerned. It matters not in whose names the titles to the lands are recorded; the harvest of knowledge and of pleasure that they yield is all yours, though like any other harvest it can only be enjoyed to the full by sharing it with others. And if you tend it well, your returns may be very much more worth while than anything the legal owners who pay the taxes and keep up the fences and trespass signs get out of it. The last-mentioned improvement may sometimes prove a hindrance, but usually there is enough wild land and enough tolerance on the part of owners to allow a wide opportunity.

Having fixed in mind the limits of your claim, there are various ways in which you may work it. The first and most important thing is to get acquainted with the ferns in their native haunts and to learn as much as possible about their structure, life history and requirements. This is a large order and it cannot be carried out at once. It will entail long tramps and hard climbs and finding your way where no paths run into remote glens and hollows or perhaps through swamps and along mountain sides where only wild creatures or the wild men who hunt them have been before. Notes should be made on each species as it is found in the field, and an herbarium of pressed and dried specimens may be made as an aid to more careful and leisurely study and as a permanent record. The specimens should be carefully labeled and mounted on cards or in a book. If you are skilful with a camera or with a pencil, a collection of photographs or of sketches showing the different ferns as they grow in their natural surroundings will be of permanent value. An even better plan, if you have the time and industry and are fortunate

enough to have a suitable place, is to start a fern garden. Most of the native species can be transplanted and grown in a specially constructed garden, but to do this successfully requires a good deal of work as well as knowledge of the special requirements of the different species. To dig up ferns indiscriminately and carry them away to be set in a city garden where they receive little care and where most of them have little chance to live is not only useless labor but it is bad farming and base vandalism.

Ferns were the first group of plants in which I became interested from the botanical standpoint, and while it was not long until my ambition broadened to include the general flora, they have never ceased to interest me, and for many years I found great pleasure in their quest and study and in adding to the list in the county where I lived.

The field of this early exploration was Jasper County, in southwestern Missouri, a county bordering on Kansas and only the third north of the Arkansas line. The county is rectangular in shape and approximately thirty miles long from east to west and twenty miles wide. It is part of the dissected plain on the west side of the Ozark uplift. Several small rivers and creeks, most of them fed by springs, traverse it from east to west, and some of the larger ones have cut wide alluvial valleys through the strata of limestone and chert of the Mississippian series that underlie most of the area. These rocks are exposed in perpendicular bluffs along the streams and sometimes on hillsides where the thin mantle of residual soil has been removed by erosion. Part of the uplands was originally prairie while the valleys were heavily wooded with a deciduous forest, most of which has been cleared away. Much of the high broken land along the streams is still covered with a somewhat stunted growth of oak and hickory. The elevation ranges from about 825 to 1175 feet above sea-level. The annual rainfall is approxi-

mately 40 inches, rather unevenly distributed and with frequent droughts in summer. The conditions in this area, as throughout the Middle-west generally, are not favorable for most sorts of ferns, and they play a much less conspicuous part in the flora than they do in the eastern states. Most of the species found are of small size and are restricted to very limited areas along rocky bluffs or wooded hillsides or the margins of streams and springs. The tall rank growths of swamp and bog ferns that are so conspicuous all over New England are entirely absent, and only one palustral species, the sensitive fern (*Onoclea sensibilis*), has been found in the county.

The first year of exploring and collecting resulted in the discovery of about a dozen species of ferns and two scouring rushes. Most of these were fairly abundant and well distributed over the county with the exception of the woolly lip-fern (*Cheilanthes Feei*) and the powdery cloak-fern (*Notholaena dealbata*), which were found only in a few places along rocky cliffs. After this the interest increased and the real fun and adventure of hunting for additional species and rarities began. A rarity in a local flora need not be so everywhere. A fern that is abundant or really common in some sections may become rare on the border of its range and its discovery may be a great occasion. The walking-leaf fern that is regarded as a prize in most parts of New England is one of our commonest species, while the cosmopolitan bracken is rare and only a few plants of it were found at two stations in the county. Additions to my list in the second year were the ternate grape-fern (*Botrychium dissectum* var. *obliquum*), very local and rare in rich woods, the hairy lip fern (*Cheilanthes lanosa*), and the rock selaginella (*Selaginella rupestris*). The last two were found together in a little chert glade of a few acres to which they are limited.

I had looked up in manuals and lists all of the ferns

that there seemed any likelihood or possibility of finding in the area. Among these were the sensitive fern, beech-fern, adder's-tongue and quillwort, besides a number of others that need not be mentioned since they were never found.

It is surprising how difficult it is to see an inconspicuous plant when you are not familiar with it nor with the precise conditions under which it grows. The story of how I first found Engelmann's adder's-tongue, after searching vainly for it for several years, within half a mile of my home and in a spot where I had often collected before, was told in a previous issue of the FERN JOURNAL.[1] But it is a somewhat surprising sequel to add that a few years later I also found *Isoetes Butleri* growing in the same little glade. However, I did not discover it there until I had made its acquaintance in another part of the county. One day while collecting along Spring River I crossed one of the little glades that are typical of the limestone outcrops. In one of the shallow depressions where water accumulates in rainy seasons I happened to notice what appeared to be a small sterile sedge. As it looked unfamiliar, I stopped to investigate and on pulling up a plant I at once recognized it as *Isoetes* from the swollen base. Another species, *Isoetes melanopoda,* was found later in a spring at the edge of the little chert glade where the lip-fern and *Selaginella* grew.

Plants are no respecters of political boundaries, especially where these are arbitrary straight lines, as is usual in most parts of the West. In Newton County, just south of our southern boundary, there is a much more extensive exposure of the chert formation than the one to the north on which the quillwort and other interesting plants are found. Shoal Creek has cut a channel for some distance

[1] *Ophioglossum Engelmanni* in Missouri, Vol. IV, pp. 66–68. 1914.

through this hard formation, which is exposed as bluffs and ledges along its course, and as glades above the river and along its tributaries. Many strange plants are found here and the *Cheilanthes, Selaginella* and *Isoetes* are more abundant than in Jasper County. On one occasion while collecting here in company with B. F. Bush I climbed down below a ledge and was delighted to discover a fine growth of the marginal shield fern, a species I had never before seen in the region. I called excitedly to Mr. Bush who was above, but before he reached me I had also found the maiden-hair spleenwort growing in clefts of the rock. A few years later I found near the same place a few plants of the gray polypody (*Polypodium polypodioides*) in dry clefts along a high ledge. None of these ferns have been found in Jasper County.

The beech fern (*Dryopteris hexagonoptera*) had also appeared tantalizingly near the southern boundary, where I had found it growing on a wooded hillside just south of Joplin and scarcely half a mile over the line. As this species was not so likely to be restricted by ecological conditions as those found on the chert, I felt that there should be a good chance of finding it somewhere in the county. By the elimination of thoroughly explored places I decided that the most promising section lay in the eastern part of the county along Center Creek where there was some wooded country that I had never visited. So one day I set out early to look for it there. I walked many miles along the creek and found a number of interesting plants and most of the familiar ferns. Several times I saw ferns at a little distance that I thought might be the one I was seeking, but on a closer inspection they proved to be the rattlesnake fern. About noon I came to the place where a little spring brook joined the creek, and on a bank just above it the little beech fern was growing in abundance. I greeted it as a long-sought friend, and

after admiring it sufficiently I sat down in a beautiful shaded spot to eat my lunch. Presently I decided to go further up the brook to look for the head of the spring and get a cool drink. I had not gone far when I came to a place where the brook spread out into a little boggy area, and there to my delight and surprise I found two or three fine clumps of the lady-fern (*Athyrium angustum* var. *rubellum*), a plant that I had never before seen anywhere near that region. This trip also resulted in the discovery of several other plants new to my general list and it could be considered one of the most successful day's works that I can recall from the standpoint of local collecting.

A list of the ferns found in Jasper County up to that time was included in a general catalogue of the flora[2] published in 1916, but as there have been several additions and changes in name a revised list is given below.

OPHIOGLOSSACEAE

BOTRYCHIUM VIRGINIANUM (L.) Sw. Abundant in rich woods and along banks of streams.

BOTRYCHIUM DISSECTUM var. OBLIQUUM (Muhl.) Clute. Rare in rich woods.

OPHIOGLOSSUM ENGELMANNI Prantl. Locally abundant, growing in large colonies in glades and on exposed limestone ledges.

POLYPODIACEAE

ONOCLEA SENSIBILIS L. Local at a few stations in boggy ground about springs.

WOODSIA OBTUSA (Spreng.) Torr. Common along partially shaded rocky ledges.

CYSTOPTERIS FRAGILIS (L.) Bernh. Common in rich woods and along moist alluvial banks.

---

[2] Catalogue of the Plants of Jasper County, Missouri, Ann. Mo. Bot. Gard., Vol. III, pp. 345–401. 1916.

CYSTOPTERIS FRAGILIS f. SIMULANS Weatherby. Frequent in wet crevices and clefts of limestone cliffs.

POLYSTICHUM ACROSTICHOIDES (Michx.) Schott. Common along wooded bluffs and hillsides.

DRYOPTERIS HEXAGONOPTERA (Michx.) Christens. Local along spring brook in eastern part of the county.

ATHYRIUM ANGUSTUM var. RUBELLUM (Gilbert) Butters. Rare and local along spring brook in eastern part of county.

ASPLENIUM PLATYNEURON (L.) Oakes. Common on rocky wooded banks, usually in acid soils.

ASPLENIUM PLATYNEURON f. SERRATUM (E. S. Miller) R. Hoffman. Rare, with the typical form.

ASPLENIUM RESILIENS Kunze. Locally abundant in clefts of limestone bluffs along the larger streams.

CAMPTOSORUS RHIZOPHYLLUS (L.) Link. Common on mossy rocks and cliffs along the larger streams.

PELLAEA ATROPURPUREA (L.) Link. Common on limestone ledges and cliffs.

CHEILANTHES LANOSA (Michx.) Watt. Local among rocks in a chert glade along Turkey Creek, near Joplin.

CHEILANTHES FEEI Moore. Locally abundant in clefts of limestone cliffs at several stations along Spring River and Center Creek.

NOTHOLAENA DEALBATA (Pursh) Kunze. Locally abundant in clefts of limestone cliffs along the larger streams.

ADIANTUM PEDATUM L. Common in rich woods and on alluvial banks.

PTERIDIUM LATIUSCULUM (Desv.) Hieron. Rare and local in dry open woods near Carthage and Webb City.

EQUISETACEAE

EQUISETUM ARVENSE L. Common along banks of streams.

EQUISETUM ARVENSE f. NEMOROSUM A. Br. Rarely found with the typical form.

EQUISETUM HYEMALE var. ROBUSTUM (A. Br.) A. A. Eaton.
Common along margins of streams.

ISOETACEAE

ISOETES BUTLERI Engelm. Local in temporarily wet depressions of limestone glades.

ISOETES MELANOPODA J. Gay. Rare and local in spring at edge of chert glade near Joplin.

SELAGINELLACEAE

SELAGINELLA RUPESTRIS (L.) Spring. Very local but abundant in chert glade along Turkey Creek, near Joplin.

ARNOLD ARBORETUM

Annotated List of Ferns of the Kilauea-Mauna Loa Section of Hawaii National Park[1]

ROBERT L. FOWLER

The Kilauea-Mauna Loa section of Hawaii National Park is located on the southeast side of the Island of Hawaii. It embraces an area of approximately 307 square miles of mountainous country which extends in a northerly direction from sea-level to the summit of Mauna Loa, 13,680 feet elevation. The diversified topography and wide range in elevation produce marked local differences in precipitation and in temperature. Freezing temperatures seldom occur below 4,500 feet elevation but are common higher up on Mauna Loa. The heaviest rainfall (80–100 inches) occurs in the region to the northeast of Kilauea Crater (4,090 feet), and the lightest (15–20 inches) occurs in the southwest, Kau Desert. Because of the wide range in elevation, various exposures, and extremes of aridity and moisture, the Kilauea-Manua Loa section supports a wide variety of ferns.

[1] Contribution no. 120 from the Department of Botany, University of Nebraska.

During the summer of 1937, the writer collected 60 species of ferns and their allies. Degener (1932) reports 6 more, which make a total of 66 species within the Park. Of these, 29 are believed to be endemic to the Islands. Ten additional species have been reported from contiguous areas and may range into the Park. The list which follows is probably not complete, as further surveys may add additional species.

Grateful acknowledgment is made to Mr. S. H. Lamb, U. S. Biological Survey, for assistance in the preparation of the manuscript, and to Dr. H. L. Lyon, Director of the Hawaiian Sugar Planters Association, for identification of material.

OPHIOGLOSSACEAE

OPHIOGLOSSUM CONCINNUM Brack. Pololei. Rare; in earthquake cracks near rim of Halemaumau, appearing after spring rains.

OPHIOGLOSSUM **falcatum** (Presl), n. comb. *Ophioderma pendulum* β *falcatum* Presl, Abh. Böhm. Ges. Wiss. ser. 5, **4**: 315 (1845) repr. (Suppl. Tent. Pterid.) 56. Reported by Degener.

OPHIOGLOSSUM PENDULUM L. Laukahi. Not common. Epiphyte on trees near Keanakakoi and Makaopuhi Craters. The Hawaiians prepared an infusion from this species which they used as a cough remedy.

GLEICHENIACEAE

GLEICHENIA EMARGINATA (Brack.) Moore. Uluhe, False Staghorn Fern. Endemic. *G. dichotoma* Hooker, in part. *Dicranopteris emarginata* (Brack.) Rob. Common in open places throughout the eastern half of the Park to an elevation of about 4,000 feet, frequently forming dense thickets. The Hawaiians prepared an infusion from this species which they drank as a laxative.

CYATHEACEAE

CIBOTIUM CHAMISSOI Kaulfuss. Hapuu, Tree Fern. Common in rain forest. The ramentum ("pulu" of the Hawaiians) was used in early days as a surgical dressing and in mummifying the dead. Between 1851 and 1884, pulu was used as a stuffing material for mattresses, pillows and for upholstery purposes in California. At the height of the industry in 1862, 738,064 pounds were exported from the Islands. The trunks of tree ferns are rich in starch and during times of famine the Hawaiians cooked this material for food.

CIBOTIUM GLAUCUM (Smith) Hooker & Arnott. Hapuu, Tree Fern. In dry, open places in Kipuka Puaulu.

CIBOTIUM MENZIESII Hooker. Hapu Iii. Common in rain forest. This species is the tallest of the tree ferns. The pulu of this species was used by the Hawaiians in the same way as that of Hapuu. The ferns are generally about one foot in diameter and 12 feet high, although they sometimes attain a diameter of 3 feet and a height of 24 feet.

HYMENOPHYLLACEAE

HYMENOPHYLLUM LANCEOLATUM Hooker & Arnott. Epiphyte; common in rain forest.

HYMENOPHYLLUM OBTUSUM Hooker & Arnott. Occasional; on moss-covered tree trunks in rain forest.

HYMENOPHYLLUM RECURVUM Gaudichaud. Ohiaku. Endemic. A very common fern on moss-covered trees and damp rocks in rain forest.

TRICHOMANES DAVALLIOIDES Gaudichaud. Kilau. Common in damp woods and on shady cliffs.

POLYPODIACEAE

ADIANTUM CAPILLUS-VENERIS L. Iwaiwa, Maidenhair Fern. Common on moist, rocky places at Hilina Pali.

Stems were worked by Hawaiians into ornamental hats and baskets.

ASPLENIUM ADIANTUM-NIGRUM L. Iwaiwa. Common in open dry places at elevations of 2800 to 7000 feet.

ASPLENIUM CONTIGUUM Kaulfuss. Possibly endemic. Common in the rain forest. Fronds variable in size and depth of lobing.

ASPLENIUM LOBULATUM Mett. Piipiilau Manamana. *Asplenium pseudofalcatum* Hilleb. Very common in rain forest. Gemmae formation is common in this species and occasionally the fronds are forked.

ASPLENIUM MACRAEI Hooker & Greville. Endemic. *Asplenium erectum* var. *macraei* Hilleb. Occasional; in shady, rocky cliffs in Kipuka Puaulu.

ASPLENIUM NITIDULUM Hilleb. Rare; in Kilauea fern forest. Reported from vicinity of Byron Ledge by both Skottsberg and Degener.

ASPLENIUM RHIPIDONEURON Rob. Iwaiwa O Kane. Endemic. *Asplenium furcatum* Hilleb. Common in open, dry kipukas.

ASPLENIUM SPHENOLOBIUM var. DIPLAZIOSORUM Hieronymus. Occasional; in moderately damp places at Hilina Pali.

ASPLENIUM TRICHOMANES L. Owalli, Maidenhair Spleenwort. A common fern on dry, rocky soil at elevations of 3,000 to 8,000 feet.

ASPLENIUM UNILATERALE Lamarck. Pamoho. *Asplenium resectum* Smith. Not very common, found on shady, wet cliffs in First Twin Crater.

ATHYRIUM POIRETIANUM (Gaudichaud) Presl. Endemic. *Asplenium aspidioides* of Hilleb., not Schlecht. *Asplenium multisectum* Brack. In very damp woods and in wet craters.

CEROPTERIS OCHRACEA (Presl) Rob. Silver Fern. An escape. Very common in the vicinity of steam cracks throughout the Park.

CONIOGRAMME PILOSA (Brack.) Hieronymus. Loulu. *Gymnogramme javanica* of Hilleb., not Bl. Wet cliffs at altitudes of 3,000 to 5,000 feet. Common in First Twin Crater.

CYRTOMIUM CARYOTIDEUM (Wallich) Presl. Kaapeape. *Aspidium caryotideum* Wallich. Occasional; along the edge of lava flow which delimits Kipuka Puaulu.

DIPLAZIUM SANDWICHIANUM (Presl) Diels. Endemic. *Asplenium sandwichianum* Hooker. Common in shady, moist localities, especially in craters.

DORYOPTERIS DECORA Brack. Endemic. *Pteris decora* Hooker. Very common in lava cracks at Hilina Pali and throughout Kau Desert.

DRYOPTERIS sp. Collected in a moderately dry hole at Hilina Pali. Doctor Lyon writes that it is a new arrival in the Hawaiian Islands and seems to be intermediate between a South American and an Asiatic form. He made his first and only collection near Hilo in 1919.

DRYOPTERIS CYATHEOIDES (Kaulf.) O. Kuntze. Kikawaeo. *Aspidium truncatum* Gaud. Very common throughout rain forest. The young shoots were eaten either as a raw vegetable or were cooked with meat and taro.

DRYOPTERIS GLABRA (Brack.) O. Kuntze. Kilau. Endemic. *Aspidium glabrum* Mett. Occasional, in open forests. Fine specimens may be seen in Kipuka Puaulu.

DRYOPTERIS GLOBULIFERA (Brack.) O. Kuntze. Palapalai O Kaumaapua. *Aspidium globuliferum* Mann. Common in the rain forest near Thurston's Lava Tube.

DRYOPTERIS HAWAIIENSIS (Hilleb.) Rob. Endemic. *Aspidium hawaiiense* Hilleb. Open forest in Kipuka Puaulu. Not common elsewhere.

DRYOPTERIS PALEACEA (Swartz) C. Chr. Laukahi. *Aspidium filix-mas* var. *parallelogrammum* Kunze. Rare; found in open forest in Kipuka Puaulu.

DRYOPTERIS PARASITICA (L.) O. Kuntze. Downy

Woodfern. Common in shady, damp places at Hilina Pali and in the craters along the Chain of Craters' Road.

DRYOPTERIS STEGNOGRAMMOIDES (Baker) C. Chr. Endemic. *Phegopteris polycarpa* (Hooker & Arnott) Hilleb. Common in shady, moist localities along the Kilauea Iki Trail.

DRYOPTERIS UNIDENTATA (Hooker & Arnott) C. Chr. Akole. Endemic. *Phegopteris unidentata* Mann. Found only in a dry, rocky gulch near the Half Way House near the Kau entrance.

ELAPHOGLOSSUM CONFORME (Swartz) Schott. Ekaha, Maui's Paddle. *Acrostichum conforme* Swartz. Common on rocks and trees in the rain forest at elevations of 1,000 to 4,500 feet.

ELAPHOGLOSSUM HIRTUM (Swartz) C. Chr. Ekaha. *Acrostichum squamosum* of Hilleb., not Sw. Common on the trunks of Ohia trees (*Metrosideros collina* var. *polymorpha*) and on exposed ridges at elevations of 3,000 to 4,000 feet.

ELAPHOGLOSSUM MICRADENIUM (Fée) Moore. Maui's Paddle, Ekaha. Epiphyte. Collected by Degener in woods near Waldon Ledge.

ELAPHOGLOSSUM RETICULATUM (Kaulfuss) Gaud. Ekaha. Endemic. *Acrostichum reticulatum* Kaulfuss. Common on rocks and trees in the rain forest.

MICROLEPIA STRIGOSA (Thunberg) Presl. Palapalai. Common on moderately moist soil and on the outskirts of woods.

NEPHROLEPIS EXALTATA (L.) Schott. Sword Fern, Okupukupu. Common throughout the humid regions of the Park and in the vicinity of steam cracks near Kilauea. A variable species.

PELLAEA TERNIFOLIA (Cavanilles) Link. Cliff Brake, Laukahi. Very common in arid regions of the Park from Hilina Pali to an elevation of about 9,500 feet.

POLYPODIUM HOOKERI Brack. Hooker's Polypody. Common epiphyte throughout rain forest.

POLYPODIUM HYMENOPHYLLOIDES Kaulfuss. Pai. Endemic. Epiphyte in rain forest at elevations of 3,000 to 4,000 feet.

POLYPODIUM LINEARE Thunberg. Ekaha Akolea. *Phymatodes elongata* (Kaulfuss) Rob. A common species found growing on trees and rocks throughout the Park. Fronds occasionally forked.

POLYPODIUM PELLUCIDUM Kaulfuss. Ae, Pellucid Polypody. Endemic. Common in open woods near Kilauea and along the Chain of Craters' Road. Commonly an epiphyte in rain forest.

POLYPODIUM PSEUDOGRAMMITIS Gaudichaud. Kolokolo. Endemic. A very common epiphyte in rain forest.

POLYPODIUM SAFFORDII Maxon. Kihi. Endemic. *P. serrulatum* of Hilleb., not (Sw.) Mett. Occasional; on moss-covered tree trunks in rain forest.

POLYPODIUM SARMENTOSUM Brack. Endemic. Common epiphyte in rain forest.

POLYPODIUM TAMARISCINUM Kaulfuss. Wahine Noho Mauna, "The Mistress of the Mountain." Endemic. Epiphyte; common in rain forest.

PTERIDIUM AQUILINUM (L.) Kuhn. Bracken, Kilau. *Pteris aquilina* L. Common in the drier regions of the Park from Hilina Pali to an elevation of approximately 9,000 feet.

PTERIS CRETICA L. Owalii, Cretan Brake. Occasional; found in Kipuka Puaulu, First Twin Crater, along the Sandalwood trail and Kilauea Iki trail.

PTERIS EXCELSA Gaudichaud. Waimakanui. Occasional; found in open forests of Kipuka Puaulu.

PTERIS LONGIFOLIA L. Long-leaved Brake. Common in vicinity of steam cracks near Kilauea, and along the road by the Chain of Craters.

SADLERIA CYATHEOIDES Kaulfuss. Amaumau. Widely

distributed in the Park, occurring in both wet and dry habitats. The Hawaiians prepared a red dye from the outer part of the trunk which they used in dyeing kapa.

SADLERIA HILLEBRANDII Rob. Amau. Endemic. Common in humid regions near Kilauea. The leaves were occasionally used in lining and thatching houses. The young leaves and pith of the stems were cooked for food.

SPHENOMERIS CHUSANA (L.) Copeland. Palaa. *Odontosoria chinensis* (L.) J. Smith. *Microlepia tenuifolia* Mettenius. Common at Hilina Pali and in the vicinity of steam cracks near Kilauea. A red dye was prepared from the leaves.

LYCOPODIACEAE

LYCOPODIUM CERNUUM L. Wawaeiole, Clubmoss. Very common in open places throughout the eastern half of the Park, frequently forming dense thickets with *Gleichenia emarginata*. Degener reports that Hawaiians suffering from rheumatism bathed in water in which Wawaeiole had been boiled for three hours.

LYCOPODIUM PHYLLANTHUM Hooker & Arnott. Clubmoss, Wawaeiole. Occasional; found on moss-covered trees near Napau Crater.

LYCOPODIUM POLYTRICHOIDES Kaulfuss. Wawaeiole. Endemic. Occasional; found on moss-covered trees near Napau Crater.

LYCOPODIUM VENUSTULUM Gaudichaud. Wawaeiole. Endemic. Common prostrate fern along the Napau Crater Trail.

PSILOTACEAE

PSILOTUM COMPLANATUM Swartz. Moa. Occasional; on trees in rain forest.

PSILOTUM NUDUM (L.) Grisebach. Moa, Pipi, Psilotum. *P. triquetrum* Swartz. Common on trees and rocks in the drier regions of the Park below 4,500 feet. Babies

suffering from "thrush" or "ea" were given a tea prepared from Moa. Powdered sporangia were used on skin inflammation caused by wearing the "malo" or loin cloth. Moa was used by the Hawaiians in a game called "fighting cock."

SELAGINELLACEAE

SELAGINELLA ARBUSCULA (Kaulfuss) Spring. Selaginella. Endemic. Occasional; in rain forest near Makaopuhi and Napu Craters.

SELAGINELLA MENZIESII (Hooker & Greville) Spring. Occasional; in rain forest near Napau Crater.

SPECIES REPORTED FROM AREAS ADJACENT TO THE PARK

Asplenium contiguum var. *laciniatum* Hilleb.	Collected by	Fowler
Diplazium arnottii Brack.	"	" Fowler
Dryopteris keraudreniana (Gaud.) C. Chr.	"	" Skottsberg
Elaphoglossum gorgoneum Kaulfuss	"	" Degener
Gleichenia glauca Hooker	"	" Degener
Gleichenia linearis Clarke	"	" Degener
Lycopodium serratum Thunberg	"	" Degener
Marattia douglasii (Presl) Baker	"	" Fowler
Trichomanes bauerianum Endl.	"	" Degener
Pteris irregularis Kaulfuss	"	" Degener

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A New Philippine Isoetes

E. D. MERRILL AND L. M. PERRY

In a collection of Philippine botanical material recently received from Mr. A. Lynn Zwickey, the apparently new *Isoetes*, described below, was noted. What is of even greater interest than the discovery of an undescribed species in this small group is the fact that this is the first record of the occurrence of a representative of the family in the Philippines; for, in the vast expanse of the Malay Archipelago, including the Philippines, but a single species was hitherto known, *Isoetes neoguineensis* Baker, from the high mountains of New Guinea.

Van Alderwerelt van Rosenburgh,[1] in his comprehensive treatment of the Fern Allies of Malaysia in 1915, indicated in his key to the families and genera: "ISOETACEAE; not in Malaya." Ridley's[2] later treatment of

[1] Van Alderwerelt van Rosenburgh, C. W. R. K. Malayan Fern Allies. Handbook to the determination of the fern allies of the Malayan Islands (incl. those of the Malay Peninsula, the Philippines, and New Guinea). Pp. xvi + 261. 1915.

[2] Ridley, H. N. The Fern Allies and Characeae of the Malay Peninsula. Jour. Straits Branch Roy. As. Soc. **80**: 139–164. 1919.

the Fern Allies and Characeae of the Malay Peninsula included no *Isoetes*. And very recently, Backer & Posthumus,[3] in an extensive study of the Ferns and Fern Allies of Java, make no mention of *Isoetes* in Java. Van Steenis,[4] in his interesting paper on the origin of the mountain flora of Malaysia, noted the paucity of the representatives of this group in the Old World tropics thus: "Ca 62 species throughout the world except the Pacific Islands, in Malaysia only 1 species," *i.e.*, the Papuan *I. neoguineensis* Baker. It may be of some interest to note that, in spite of the vast amount of field work accomplished in China in the past century, only two species of the genus have been described from that region: *I. hypsophila* Handel-Mazzetti, the type-material collected by himself in northern Yunnan in 1915; and *I. sinensis* Palmer based on material collected by Merrill and Steward, near Nanking, in 1922. A brief summary of the characters of the Philippine species follows:

Macrospores of Isoetes philippinensis.

Isoetes philippinensis, sp. nov. § Reticulatae Pfeiffer.

Planta aquatica (cormo verisimiliter 3–4-lobato); foliis numerosis, elongatis (usque ad 50 cm. longis), gracilibus, subflaccidis, in medio longitudinis 3 mm. latis,

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[3] Backer, C. A., and Posthumus, O. Varenflora voor Java. Pp. xlvii + 370, 81 figs. 1939.

[4] Van Steenis, C. G. G. J. On the origin of the Malaysian mountain flora. Bull. Jard. Bot. Buitenz. III. 13: 169. 1934.

basi circiter 7 mm. latis, fasciculis fibrosis periphericis destitutis, basi ± membranaceo-alatis; vaginae marginibus hyalino-membranaceis, 3–4 cm. longis, angustis (1.5–2 mm. latis), sursum gradatim angustatis; ligula elongata, triangulari-ovata; velo nullo; sporangio oblongo ± 9 mm. longo, 3 mm. lato, pallido; macrosporis diametro 385–455 μ (av. 420 μ), costis prominulis, in faciebus apicalibus plerumque laevibus, interdum rugulis tantum perpaucis notatis, in facie basali reticulatis, rugis humilibus; microsporis 25–30 μ longis, circiter 22 μ latis, minutissime scabridulis.

Philippine Islands, Mindanao, Lanao Province, vicinity of Olangu, near Momungan, *Zwickey 776* (TYPE in Gray Herbarium, isotype in the herbarium of the University of Michigan), November 18, 1938, floor of a spring stream, 400–500 m. alt.; aquatic, leaves eaten (?). Native name "Kabauingbauing" (Lan.).

Isoetes philippinensis is a tall plant, in general appearance suggesting *I. japonica* A. Br., but the leaves are longer and subflaccid, and the macrospores are a little smaller and differ in the details of the exospore. In the former, the macrospores are shallowly reticulate on the basal face (the network consisting of very low ridges) and mostly smooth on the apical faces (occasionally, on the lowest part of the apical faces, a spore shows a few short ridges perpendicular to the equatorial ridge and immediately above it); the microspores are minutely roughened. In *I. japonica* A. Br. the macrospores are reticulate on all the faces, and the microspores are smooth.

ARNOLD ARBORETUM

A Trip to a Station for Hymenophyllum in South Carolina

DONOVAN S. CORRELL

My first trip into the mountains of South Carolina in search of filmy ferns, which at the time were[1] rumored to be growing there, was made during August, 1937, with Lane Barksdale. We botanized along the Keowee River and some of its tributaries in the vicinity of Jocassee in Pickens County. While in this interesting region we travelled for a number of miles through dense, humid forests, traversed many ravines whose banks were covered with the once mythical *Shortia galacifolia* T. & G., and forded deep and swiftly flowing streams in some of the gorges which are so numerous in the Southern Appalachians of South Carolina. We found many interesting species of ferns and flowering plants and an abundance of liverworts and mosses covering the rock ledges and rock faces which we examined, but not a vestige of filmy fern could we find.

During the intervening months a number of explorations were made in this region by various botanists, among whom were Dr. E. T. Wherry and Mr. J. E. Benedict, Jr. All of these forays were made in vain.

In June, 1939, Dr. Wherry, Mr. Benedict and I decided to turn our attention to several large streams in the northern part of Pickens County after having eliminated the previously explored areas. We sought out the most interesting and likely stream to follow. After travelling for some little distance in comparatively flat country, all the while following a cold mountain stream which at times had to be waded, we began to climb gradually. As we progressed, the water seemed to be falling more rapidly

[1] See Mary S. Taylor, Filmy Ferns in South Carolina, Journ. Elisha Mitchell Sci. Soc. 54: 345–348. 1938.

and the going became more difficult. The plants, too, became more interesting as we climbed. The terrain, though facing directly south, showed evidence of supporting a vegetation which exhibited northern affinities rather than southern.

After we had walked for about two miles we heard in the distance a low rumbling as of water falling from some little height. Our pace and eagerness were accelerated as the sound of the rushing and falling water increased. We came abruptly upon a series of small waterfalls, above which was a narrow, deep flume. Towering above the flume were perpendicular faces of granite-gneiss. The west side of the stream was flanked by a precipitous wall which was moist below but rather dry near the summit. There were several small tributaries on the northeast side of the stream just above the flume which fell in small torrents over the bare rocks from the steep slopes above. I climbed up two of these streams which were densely shaded by Rhododendron thickets and observed luxuriant growths of mosses and liverworts along their banks. The continued and rapid fall of the water from these small streams, together with that of the larger falls at and below the flume, created a constant spray which kept the air cool and moist. This condition, continuing throughout the year, evidently tends to maintain a comparatively moderate and even temperature in the narrow gorge.

After some hunting, *Trichomanes Petersii* A. Gray (#11000)[1] and *Hymenophyllum tunbridgense* (L.) J. E. Smith (#11021) were found in some abundance. The former species, which had already been found on several rocks further downstream, occurred in mats several feet square on some of the rock faces which were examined. A number of moss and liverwort collections were obtained from the locality.

[1] The writer's collection numbers.

The *Hymenophyllum* colony at this station is definitely protected from excessive cold since it not only has a southerly exposure but the gorge makes an abrupt westerly bend several hundred feet above the flume, thus creating a barrier from the northern winds by its precipitous slopes. The abrupt bend gives the gorge a dead-end appearance so that when the waterfalls and flume are approached from the south the gorge appears to end abruptly against a high wall.

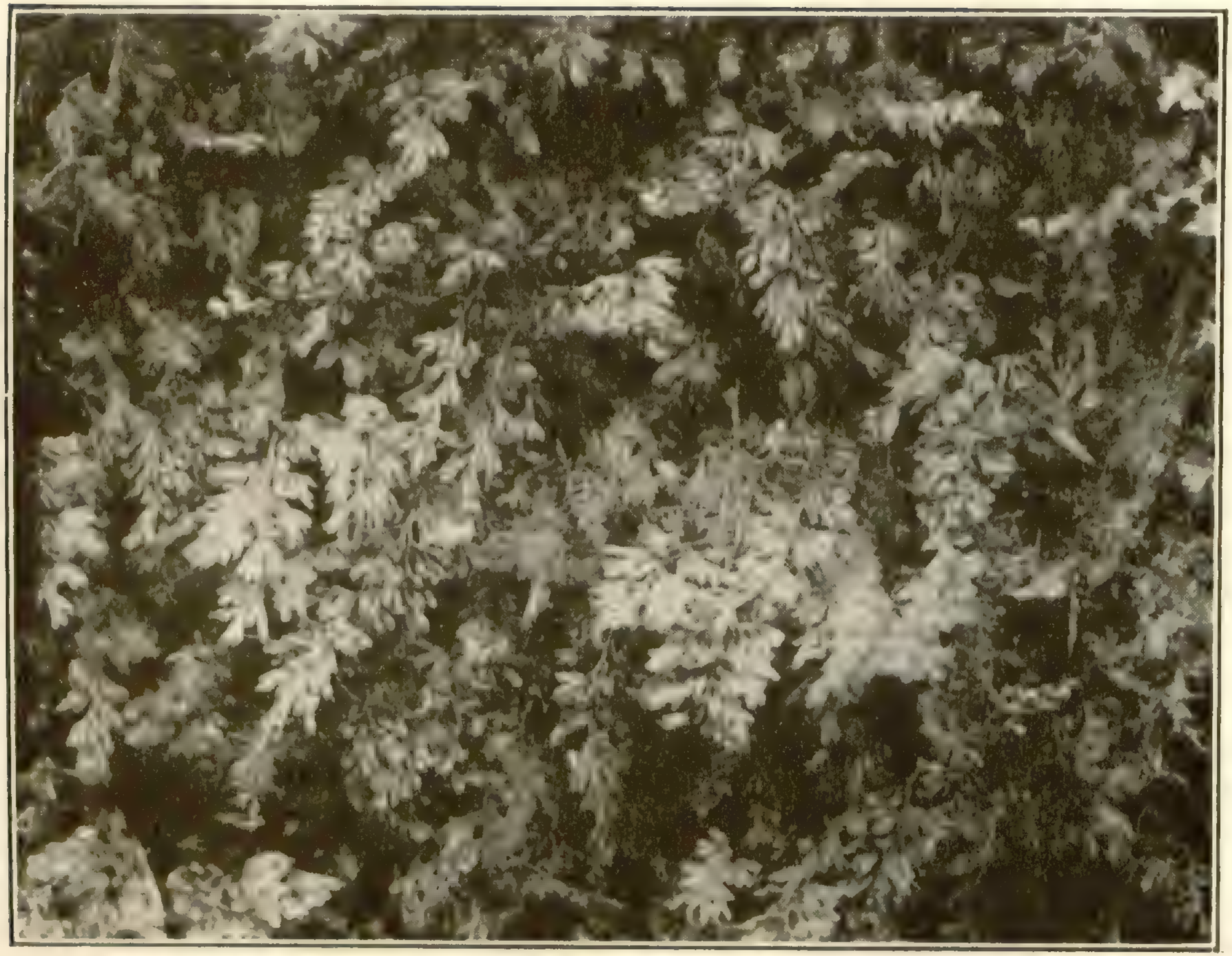
Dr. Wherry succeeded in taking two photographs of the *Hymenophyllum* which are published herein, plates 1 and 2. Plate 1 gives a general idea of the habitat, a vertical face of granite-gneiss; plate 2 shows a near view of the fern.

During the entire trip along the stream we saw on nearly all sides tremendous rock ledges and barefaced rocks, many of which were moist from continual seepage. Numerous swiftly flowing tributaries fed the stream from all directions. Upon following several of these streams away from the main gorge, we found them to lead into deep, narrow valleys which were sheltered, similarly to the one we had been following, by steep mountain slopes.

We were so interested in looking for the *Hymenophyllum* that very little attention was given to the general vegetation. However, as stated above, the species of plants observed exhibited northern affinities, corresponding with the vegetation generally found at much higher altitudes. Such species of ferns as *Asplenium platyneuron* (L.) Oakes (#11025), *Cystopteris fragilis* var. *protrusa* Weatherby (#11020) and *Dryopteris spinulosa* var. *intermedia* (Muhl.) Underw. (#11024) were seen quite often, and the interesting and rather rare *Hydrangea radiata* Walt. (#11019) was found near the station.

The moss and liverwort specimens which were collected at the *Hymenophyllum* station were identified by Drs.

Hymenophyllum tunbridgense in South Carolina, habitat view.



Hymenophyllum tunbridgense in South Carolina, near view of the plants.

L. E. Anderson and H. L. Blomquist, respectively. According to Dr. Anderson, all but one of the mosses were of northern affinity, this being *Syrrhopodon texanus* Sull. (#10981) which is common in Florida and is found along the coastal region west to Texas and in the east to Long Island. This is perhaps the first collection reported from the mountains of South Carolina. Another species, *Plagiothecium subfalcatum* Aust. (#10992), whose range was thought to be from the mountains of New Jersey to Vermont and New Hampshire, west to Missouri, was also collected. This is the southernmost station for this species. Dr. Anderson had previously collected this species in North Carolina at the Cascades, Moore's Springs.

Other mosses which I collected at the station, all of which exhibit northern affinities, were: *Eurhynchium rusciforme* (Neck.) Milde. (#11007), *Fissidens osmundoides* Hedw. (#11001), *Hookeria acutifolia* Hook. (#11003), *Hygroamblystegium irriguum* (Wils.) Loeske (#10988, in part), *Hypnum molluscum* Hedw. (#11018), *Leucobryum glaucum* (Hedw.) Schimp. (#11005), *Mnium affine ciliare* (Grev.) C.M. (#10994), *Plagiothecium denticulatum* (Hedw.) B.S.G. (#11014), *P. turfaceum* (Lindb.) Lindb. (#11006), *Porotrichum alleghaniense* (C.M.) Grout (#11008), *Sciaromium Lescurii* (Sull.) Broth. (#11009), *Sematophyllum carolinianum* (C.M.) E.G.B. (#10983) and *Thuidium delicatulum* (Hedw.) Mitt. (#10998).

Some of the most interesting and important collections of liverworts found at the station were: *Dumortiera hirsuta* (Sw.) Reinw. (#10990), *Jubula pennsylvanica* (Steph.) Evans (#10997), *Metzgeria myriopoda* Lindb. (#10986), *Radula Sullivantii* Aust. (#10996), *Riccardia sinuata* var. *major* (Lindb.) MacV. (#10989) and *Trichocolea tomentella* (Ehrh.) Dumort. (#11002).

Drs. Anderson and A. J. Sharp later visited the station and found *Hygrohypnum alpestre* (Hedw.) Loeske, a re-

markable find since the moss had been known before only from British Columbia, Alaska and Greenland. While at the station, Dr. Anderson found the following mosses growing with and among the *Hymenophyllum* plants: *Homalia Jamesii* Schimp. (the southernmost station), *Bartramia pomiformis* Hedw., *Aulacomnium heterostichum* (Hedw.) B.S.G. and *Mnium hornum* Hedw.

Judging from first-hand observation and the above data it would seem that the gorge, although facing southward, supports a northern type of vegetation. Also, since the stream along which the *Hymenophyllum* grows rises in the lower mountains of North Carolina, it is very probable that after further exploration is undertaken *H. tunbridgense* may be found in some similar situation in that state.

BOTANICAL MUSEUM, HARVARD UNIVERSITY

Shorter Notes

TWO FERNS NEW TO KENTUCKY.—In May, 1939, Dr. L. H. Bailey and his daughter, Miss E. Z. Bailey, spent several days botanizing in Kentucky. At Nazareth, in Nelson County, they found a spontaneous growth of three species of ferns in the bottom of an excavation, four to five or more feet deep, below the glass-enclosed gymnasium of Nazareth Junior College. Specimens taken were placed on my table for identification. I determined these as *Dryopteris dentata* (Forsk.) C. Chr., *Pteris multifida* Poir. ex Lam., and *Adiantum Capillus-Veneris* L. Neither the *Dryopteris* nor the *Pteris* were listed by McCoy in his paper on "The Ferns and Fern Allies of Kentucky" (AM. FERN JOUR. **28**: 101–110, 1938), while the *Adiantum* was definitely cited as at present only in Pulaski County. Although these ferns probably will not persist at Nazareth, it seems worth while to put this occurrence on record.

Specimens of all of the above are on file in the herbarium of the Bailey Hortorium. Duplicate sheets of the *Dryopteris* will be sent to the United States National Herbarium and the Gray Herbarium.—ROBERT T. CLAUSEN, *Bailey Hortorium, Cornell University, Ithaca, New York.*

A NORTHWARD EXTENSION OF RANGE FOR HYPOLEPIS REPENS.—Although the spring fern, *Hypolepis repens* (L.) Presl, has been known from Florida since 1895, only a very few stations were known there for it for many years. Recent investigations, however, have shown it to have a fairly wide distribution in Central Florida. In February, 1938, the author found it at a location nearly one hundred miles north of any other known station. At the head of Gold Head Branch in Gold Head State Park in Clay County, a small but thriving colony grows in the seepage spring which is the source of the creek. The habitat is under a broad-leaved hammock-type forest cover and is exceptionally well protected, being deep in a steep ravine. Additional specimens were found established on a rotten log in the stream about a half mile below the larger colony.—STEPHEN H. SPURR, *New Haven, Conn.*

FERTILE SCOTT'S SPLEENWORT.—At the field meeting of the Fern Society at Lancaster, Pennsylvania, Mrs. Alice Miller found a plant of Scott's Spleenwort which she was allowed to dig up and bring home. She put it in a terrarium, where, in a very short time, it began making new plants at the tips of the fronds. She gave me two of these small ferns which I also put into a terrarium. They grew rapidly and not only produced plants at the ends of fronds, but fruited heavily. As soon as I had some ripe spores, I sowed them; they germinated readily and gave me a great many plants. Since then I always

have some Scott's coming along, as I sow spores every year.

Also, I keep two or three mature plants in a terrarium by themselves so that I may be sure of having spores. These, of course, give new plants from the tips of their fronds as well. They have sowed their own spores, so that the soil in the terrarium has been covered with prothallia.

I do not keep the old ferns in the terrarium longer than two years. By that time, I feel, they need a rest, so I take them to my garden as early in the spring as possible. I have lost a great many of them. In fact, last year (1937–38), is the first time I have brought any Scott's through a winter in my garden, in good condition. Some have lived through the winter, but died early in the spring. Last year I covered these plants with panes of glass and over the glass I spread a thick mulch of pine-needles. These three came through in fine condition and have made good growth.

I have distributed Scott's to quite a few people and am glad to do so. However, I fear that most of them have been lost, as I lost mine. I always send two or three plants to a person and advise that one be kept under glass, to make sure of *it*, at least.—GRACE B. GRIFFETH, *Rochester, New York.*

Recent Fern Literature

Maurice G. Brooks has produced a well-planned and well-wrought fern flora of West Virginia. Under each of the 76 species recorded from the state are given synonyms, common name or names, an abridged description, a detailed and careful statement of habitat—a feature especially to be commended—general range, a list of counties in the state in which the species in question has been found, and a paragraph or two of discussion and comment, often emphasizing points helpful to the inexperienced student of ferns. Sixteen plates illustrate technical terms and all the species of true ferns (not the fern allies). The drawings, by A. S. Margolin, are very good, and they introduce what looks like a useful innovation. Certain distinctive features of the plants are indicated, on the plates, by inscriptions and arrows—thus, for instance, the auricled pinnae of the Christmas fern, the scaly surface of the gray polypody, and the hairy rachis of the silvery spleenwort are quite literally *pointed* out. There are keys to families, genera and species; an introduction, concise, sensible and to the point, and containing a kindly reference to the Fern Society which will be appreciated by all of us; a glossary, bibliography and index. In short, the little work is very well equipped, handy and dependable to use.

Its weakest point is in the keys; they somewhat lack incisiveness, probably because of too great an effort to avoid technicalities. And an occasional direct error has crept into them. All the *Ophioglossaceae* (p. 8) are said to have simple fertile spikes, which is certainly not the case with *Botrychium*. "Sori covered by indusia . . . borne on the under side of reflexed lobes," the key character of *Adiantum* (p. 16), gives an incorrect impression; there is no indusium except as the reflexed lobes themselves perform the function of one. *Cheilanthes* (p. 16) with "distinct or contiguous sori" is placed under

the main key-heading "Sori not distinct." In the first line on page 23 "fertile" should read "sterile."

Outside the keys, *Botrychium lanceolatum* (p. 10) is not, as listed, a direct synonym of *B. angustisegmentum*. The entry should read, as in similar cases elsewhere, "*B. lanceolatum* of American authors, in part." On page 27 Otto Kuntze and Gustav Kunze are confused. Core (p. 32) was not, as the text would seem to imply, the only (or the first) author to note and to seek to explain the presence of coastal-plain species in the Appalachians. Redfield, Kearney, Harshberger, Witmer Stone, Small and Fernald had previously discussed the matter and arrived at like conclusions. The same species appears as *Athyrium acrostichoides* on one page and *A. thelypteroides* (correct) on the next (39, 40). *Athyrium angustum* var. *rubellum* has wandered from its proper abiding-place and come to rest under *A. asplenioides*, where it does not belong. And it was hardly giving due honor to Dr. Wherry to refer to him (p. 5) as editor of the FERN JOURNAL when he was, at the time, president of the Society.

I do not enjoy listing in detail such minor and rather technical flaws in an otherwise excellent piece of work. I have done so, in this case, in the hope that the corrections so made may increase, by a little, the value of a very useful local manual and floristic record.[1]—C. A. WEATHERBY.

Prof. Hamblin of the Lexington (Mass.) Botanic Garden has issued a leaflet on the small ferns of the northeastern states as subjects for cultivation. The rock-inhabiting Aspleniums, the two bladder-ferns, Woodsias, two lip-ferns, cliff-brake, climbing fern, walking fern, hart's-tongue, and adder's-tongue are discussed, with expert advice as to how and where they should be grown.[2]

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[1] Brooks, M. G. The Pteridophytes of West Virginia. With drawings by A. S. Margolin. West Virginia University Bulletin, series 39, no. 2. 1938.

[2] Hamblin, Stephen F. Lexington Leaflets 9: 29–32. 1939.

American Fern Society

Report of the President for 1939

My nomination and election to the presidency of the American Fern Society in the autumn of 1938 came as a complete and decided surprise. Although I did not feel qualified to take the position so admirably filled during the last few years by Dr. E. T. Wherry, I did accept the honor bestowed on me and have tried to blunder along as best I could in an office of which the burdens are thoroughly pleasant and not too great.

The outstanding accomplishment within the Society in the last year was the completion of the 25-year Index to the FERN JOURNAL. This was compiled by Dr. Wherry with NYA and WPA assistance. It is an excellent index and should make the use of back numbers of the Journal both more pleasant and profitable. With the Society's finances in good order when I took over control, it was possible for the Council to authorize payment for the Index and its free distribution to all present members of the Society. This expenditure has greatly reduced our reserve in the treasury, however, with the result that we now more than ever need the continued support of every old member and as many new members as possible. Members can do the Society a good service by recruiting for membership those of their friends who have interest in ferns and natural history studies.

Several meetings and field-excursions have been held within the year. In last February, a highly successful local meeting was held at the Brooklyn Botanic Garden. This was called and planned by the Treasurer, Dr. H. K. Svenson, and one of the editors, Dr. R. C. Benedict. At that meeting, interest was expressed for the arrangement of field-trips, also a summer meeting in connection with the summer convocation of the American Association for

the Advancement of Science. Accordingly, I proceeded with various plans. For the meeting in June at Milwaukee, Professor Steil of Marquette University made elaborate plans, engaging for us the Trustee's room at the University and commandeering cars for a grand field-trip. But alas, the enthusiasm expressed in February for such a meeting had so far waned by June that I am ashamed to report that not one member of the American Fern Society, additional to Professor Steil, attended the meeting. Attendance for the week-end excursion in Wayne County, Pennsylvania, which proved highly profitable and yielded many fern novelties, likewise was very poor. Because of this strange indifference towards organized field-activity, it does not seem reasonable to plan an elaborate schedule of trips for this year, but instead to suggest that members devote their attention to the ferns of their own local regions, as they apparently prefer to do. If I receive sufficient requests to arrange trips, I shall be glad to make plans, of course, but there seems no point in doing so if there is no interest.

The winter field-meeting in Florida will be reported elsewhere in the Journal, hence I shall not further mention it here. If this kind of affair proves popular, it might be possible to make similar arrangements in future years.

A subject which should receive the attention of all lovers of ferns is that of conservation. When any area rich in ferns or other plants is threatened with destruction, the officers of the Society should be notified and official protest registered, even if the plants cannot be saved. Within the year, work has begun in South Carolina on the building of dams and clearing of land which will destroy thousands of acres of interesting country in the Santee River Valley, particularly fascinating to botanists because it is the old collecting ground of that

famous botanical pioneer, Thomas Walter. The little *Ophioglossa* which grow in that country, the group of ferns on the limestone at Eutaw Springs, numerous species of beautiful herbs and trees, all these will perish with the flooding of this area. Botanists of a later day will wonder what was wrong with their twentieth century predecessors who could permit such catastrophes to occur without raising their voice to prevent the tragedy. What is happening in South Carolina is taking place all over the country. Rather than arguing about nomenclature and the trivialities of our study, professional and amateur students alike may do well to join forces and help to save at least a small part of this country, with its native fern flora along with all the rest of the plants and animals, in a somewhat near natural condition.

ROBERT T. CLAUSEN

Report of the Secretary for 1939

During the year 1939 the American Fern Society suffered unusually severe losses in the deaths of seven of its members. The passing of such devoted and helpful members as our Vice-President, Arthur N. Leeds, and of Prof. John H. Schaffner has been reported in the JOURNAL earlier in the year. Of our Life Members, the name of Nathaniel T. Kidder is now removed; and future lists without the names of Will S. Monroe and D. LeRoy Topping will seem strangely incomplete.

Thirty-two new members joined the Society during the year, making the total on December 31st three hundred and fifty. This is a small, but steady, gain year by year.

President Clausen appointed early in the year, Prof. Joseph Ewan of the University of Colorado, to fill the vacancy in the vice-presidency left by the death of Mr. Leeds.

A number of meetings of the Society were held at various centers during the year. The one in early February at the Brooklyn Botanic Garden has been reported in the JOURNAL. Over the Labor Day week-end a Field meeting was held in the Lake Shehawken region of Pennsylvania. And the annual meeting in conjunction with the convocation of the American Association for the Advancement of Science at Columbus, Ohio, in December is reported more in detail elsewhere in this issue.

The results of the annual balloting in November, given in full elsewhere, returned the same officers for the year 1940.

ELSIE G. WHITNEY, *Secretary*.

Report of the Treasurer for 1939

Receipts

Cash on hand Jan. 1, 1939			$ 426.28
1937 Membership Arrears	$ 1.50	$ 1.50	
1938 Membership Arrears	18.00	18.00	
1939 New Members	27.00		
1939 Membership Renewals	366.02	393.02	
1940 Membership Renewals	15.00		
1940 New Members	18.00	33.00	
1938 Subscription Arrears	1.25	1.25	
1939 New Subscribers	13.53		
1939 Subscription Renewals	68.48	82.01	
1940 Subscription Renewals	32.59	32.59	
Sale of back numbers A. F. J.	77.80	77.80	
Sale of Hart's Tongue Ferns	.75	.75	
Sale of Key to the Ferns	.50	.50	
Gifts (cash)	35.00		
Gifts (books) D. LeRoy Topping Bequest	72.80		
1939 Advertising—Cambosco	4.00	111.80	752.22
			$1,178.50

Disbursements

Science Press		
A. F. J. Vol. 28, No. 4 & Memb. List	193.49	
A. F. J. Vol. 29, No. 1	125.10	
A. F. J. Vol. 29, No. 2	135.58	
A. F. J. Vol. 29, No. 3	152.94	
Reprints	35.11	
7400 printed envelopes	35.40	677.62
Trade Discount	5.66	5.66
Agency Commission	6.24	6.24
Bank Charges	.30	.30
Gifts (books) transf. to Inv. A. F. J.	22.80	
Gifts (books) transf. to A. F. S. Library	50.00	72.80
Expense Treasurer	39.01	39.01
Expense Secretary	33.38	33.38
Expense Librarian	6.00	6.00
		841.01
Cash on hand December 31, 1939		$ 337.49

Statement, Dec. 31, 1939

Assets			*Liabilities*	
Cash on hand	$337.49		Capital a/c	$4,829.83
Cash in closed bank	7.05		1940 Memb. Susp. a/c	33.00
In Spec. a/c #1	520,32		1940 Subcrip. Susp. a/c	32.59
In Spec. a/c #2	25.88	890.74	1939 Def. Susp. a/c	167.78
Accts. Receivable		12.85	Bissell Herb. Fund	520.32
Notes Receivable		3,200.00	Life Memb. Fund	25.88
Inventory A. F. J.		1,255.81		
A. F. S. Library (books)		250.00		
		$5,609.40		$5,609.40

HENRY K. SVENSON, *Treasurer.*

Report of the Judge of Elections

Total votes cast, 91, unanimously for the nominations submitted by the Nominating Committee. The following are therefore elected:

President, Dr. Robert T. Clausen, Ithaca, New York.
Vice-President, Prof. Joseph Ewan, Boulder, Colorado.
Secretary, Mrs. Elsie G. Whitney, Albany, New York.
Treasurer, Dr. Henry K. Svenson, Brooklyn, New York.

H. L. BLOMQUIST, *Judge of Elections.*

REPORT OF THE COLUMBUS, OHIO, MEETING.—As an affiliate of Section G, of the American Association for the Advancement of Science, the Fern Society held its annual session on Saturday morning, December 31st, 1939, at Columbus, Ohio. About twenty-five members and friends were present to hear Dr. E. T. Wherry talk on the Ferns of Ohio, stressing especially the ones whose geographical distribution finds a frontier within that state. Certain other interesting facts about recent discoveries were discussed, including the finding of the filmy fern, *Hymenophyllum tunbridgense,* in a mountain ravine in South Carolina. A series of colored lantern slides used with this talk brought the ferns and their habitats clearly before the audience.

Prof. Joseph Ewan discussed the systematic status of the Pacific Sword Fern as related to its distribution in the state of California, showing that certain well-defined subspecies are pretty well localized within rather definite geographic areas.

These formal talks were followed by informal discussions in groups around fresh material, and a large series of mounted specimens of *Botrychium,* giving opportunity for the exchange of many interesting brief facts.

Several other papers dealing with various aspects of ferns were presented at other sessions. Noteworthy among these was a paper and discussion in the Systematic Section of the Botanical Society of America by Dr. R. T. Clausen on the Variations of *Ophioglossum vulgatum,* illustrated by lantern-slide photographs of herbarium specimens. Variation in size and shape of blade, in shape

of sporangia, and in degree of persistence of a basal sheath were regarded as, in this species, not to be relied upon as criteria for the segregation of varieties.

Also in this Systematic Section, R. M. Tryon reported on a hybrid *Osmunda.*

In the Paleobotanical section Dr. Gilbert M. Smith presented a paper on the origin of the pteridophytes, in which he reviewed the various lines of argument that have heretofore been advanced in attributing the origin of the ferns either to the red algae or to the liverwort group of the Bryophytes. After a critical consideration of the various factors, the greater weight of probability—since no actual "missing link" in this case has been found—seems to indicate an ancestral form of the general type of *Anthoceros.*

It is to be hoped that all the members of the Society who could not be at Columbus may have access to the facts presented in these papers through their early publication in the various periodicals.—E. G. WHITNEY.

I have a few desert ferns of southern California which I should like to exchange with anyone interested. I have at present on hand the following: *Pellaea ornithopus, P. andromedaefolia, Pityrogramma triangularis, Cheilanthes californica, Ch. Covillei, Notholaena Newberryi, Dryopteris arguta.* Any exchange would be welcome, but I should be particularly pleased to obtain *Schizaea pusilla* of the New Jersey pine barrens, *Camptosorus rhizophyllus,* or any of the filmy ferns.—HARRIET E. BAKER, *642 West 97th St., Los Angeles, California.*

Mr. Henry W. Merrill, now in his eighty-first year, long known as a skilled worker in wrought iron and as a naturalist, and a member of this Society since 1906, has been honored in a peculiarly fitting manner by his fellow-citizens of Hiram, Maine. They have purchased a fifteen-

acre tract of wild land, remarkable for the variety of habitats it includes and possessing in its plant cover most of the woody and many of the herbaceous species native in that part of Maine. This tract will be kept permanently as a public preserve, to be known as the Henry W. Merrill Botanical Garden.

New members:

Baker, Miss Harriet E., 642 West 97th St., Los Angeles, California
Boyd, Mrs. Kathleen S., 95 Fayette St., Nelsonville, Ohio
Burns, Mrs. E. W., 805 Moorland Road, Okmulgee, Oklahoma
Dutrannoit, A., Bruges, St. Pierre, Belgium
Grannie, Mrs. J. Kidwell, Flemingsburg, Kentucky
Jones, Dr. Clyde H., Ohio State University, Columbus, Ohio
Lord, Mrs. M. L., 101 Clay St., Burlington, Iowa
McCutcheon, Dr. Morton, Medical School, University of Pennsylvania, Philadelphia, Pa.
Mann, M. D., Jr., 625 Locust St., Roselle, New Jersey
Morton, C. V., Smithsonian Institution, Washington, D. C.
Osgood, Miss M. Elsie, Braintree Hill, Randolph, Vermont
Poole, Prof. James P., Dartmouth College, Hanover, New Hampshire
Smith, Mrs. Donald F., 2332 Hollyridge Ave., Hollywood, California
Speck, Dr. Frank G., 103 Cornell Ave., Swarthmore, Pennsylvania
Trapido, Harold, Zoological Laboratory, Cornell University, Ithaca, N. Y.

Changes of address:

Dean, Mrs. Ada F. T., 20 Euclid Ave., Pittsfield, Mass.
Miller, Mrs. Lawrence Kelton, 500 William St., Pittsfield, Mass.
Potter, Mrs. Millicent, 943 Boulevard East, Weehawken, New Jersey
Proctor, George R., 811 Fifth Ave., Marietta, Ohio
Steil, Prof. William N., 1926 North 53rd St., Milwaukee, Wisconsin
Tryon, R. M., Jr., 501 Washington Ave., Terre Haute, Indiana
Wright, Miss Mary F., 538 Locust Ave., Germantown, Philadelphia, Pa.

I would like to exchange Ferns of Indiana and Wisconsin for Ferns, excepting the Fern Allies, of any region of North America, except the Middle West.—R. M. TRYON, JR., *Freelandville, Indiana.*

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Vol. 30 April-June, 1940 No. 2

American Fern Journal

A QUARTERLY DEVOTED TO FERNS

Published by the

AMERICAN FERN SOCIETY

EDITORS

C. A. WEATHERBY

R. C. BENEDICT W. R. MAXON

CONTENTS

Ferns in the Kutztown-Fleetwood Area, Pennsylvania — C. L. Gruber 41
Selaginella rupestris in Arkansas — D. M. Moore 50
Cyrtomium in Southern California — H. H. Tracy 52
Notes on Texas Ferns — H. B. Parks 56
Recent Fern Literature 62
Shorter Notes: Distinguishing between Botrychium obliquum and B. dissectum; a Correction; an Osmunda Hybrid 63
American Fern Society 68

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Council for 1940

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American Fern Journal

Vol. 30 April–June, 1940 No. 2

Ferns and Fern Allies in the Kutztown-Fleetwood Area, Berks County, Pennsylvania

C. L. Gruber

As originally intended, this paper was to be a report on the ferns and fern allies in the vicinity of Kutztown, Pa.; but in 1938 the writer moved from Kutztown to Fleetwood, five miles southwestwardly from Kutztown. So the report has been extended over a somewhat larger area, more or less triangular in shape, covering about sixty square miles of territory in the northeasterly part of Berks County, Pa., and ranging generally from three to six miles beyond Kutztown and Fleetwood, with a few more distant outlying stations. The borough of Kutztown is in the northern portion, about midway between Topton near the eastern end and Virginville near the western end. The borough of Fleetwood is in the southern portion, southeast of Virginville, and Lyons and Bowers are in a southwest to northeast line between Fleetwood and Topton.

On the south and southeast this area includes a part of the South Mountains, a low range 600 to 1200 feet above sea level, with a number of usually shallow ravines, each as a rule with its mountain rill and an occasional moist or swampy level; with a few small sphagnum swamps; with the slopes and upper levels usually very stony or strewn with boulders and the summits or higher

[Volume 30, No. 1 of the Journal, pages 1–40, plates 1 and 2, was issued March 27, 1940.]

slopes frequently studded with larger rocks, solitary or in ridges. The rocks of the more elevated regions are usually of the granitic type and those of the lower slopes are commonly Potsdam sandstone. The rest of the area is mainly rolling agricultural land, decidedly hilly toward the west, where there are numerous wooded hills and bluffs, mostly flanking the streams. Sacony Creek and Moselem Creek flow westwardly through the area into Maidencreek which passes through the western border and Mill Creek flows through the northern part curving westward into the Sacony. Iron ore was formerly mined in the eastern and southeastern part, in the middle section limestone is abundant, in the western section limestone is largely displaced by shale of several types.

The specimens collected represent very nearly the entire fern flora of Berks County. The Kutztown-Fleetwood area must be credited with 55 species, varieties, and hybrids of ferns and with 11 species and varieties of fern allies; also with 23 published forms of ferns and 5 published forms of fern allies. In addition to these, 3 forms of ferns, not previously named, are described in this paper. Possibly there are also genuine specimens of other named forms in the collection.

These specimens, with very few exceptions, were collected by the writer, in numerous fern tramps throughout the region. It is, however, next to impossible to cover every square rod of ground in an extended area and it is a fact, backed by experience, that some rare fern or fern ally may be found at one particular spot and not at any other station within a radius of many miles—and a spot like this may be passed within fifty or fewer feet without discovery. So it is possible that a few additional ferns and fern allies may still be found in the Kutztown-Fleetwood area.

I wish to acknowledge my obligations to Mr. W. H.

Leibelsperger, of Fleetwood, Pa., to Mr. William C. Brumbach, of Esterly, Pa., and to Mr. Hans Wilkens, Dr. David Berkheimer, and Mr. Byron Nunemacher, of Reading, Pa., for valuable assistance in locating a number of species; also to Mr. C. A. Weatherby, Dr. E. T. Wherry, Dr. R. C. Benedict, and Dr. R. T. Clausen, for much appreciated service in identifying a few of my specimens or confirming my identification of some of the others.

The following list gives the species, hybrids, varieties, and forms which were found.

BOTRYCHIUM SIMPLEX E. Hitchc. var. LAXIFOLIUM Clausen. One station, about 50 plants, in and along an old woods trail on n.w. slope of Guinther's Head, South Mountains, about 1¼ mi. s.e. of Bowers. One plant found in woods beyond Deisher's Hill, 1½ mi. w. of Kutztown. Rare.

Specimens were collected also of plants approaching *B. simplex* var. *tenebrosum* (A. A. Eaton) Clausen and *B. simplex* f. *subcompositum* (Lasch) Milde.

BOTRYCHIUM SIMPLEX var. COMPOSITUM (Lasch) Milde. First station as above. This is farther south than the recorded range and the sterile blade of my specimen is bifid instead of ternate (but var. *compositum* has been described as having usually three, sometimes two or four divisions). The sterile blade of my specimen is inserted basally.

BOTRYCHIUM MATRICARIAEFOLIUM A. Br. A number of stations along old woods trails, in stony woods, and along woodland borders. Sometimes on rather dry slopes. Fairly common. Plants were found with forked sterile and forked fertile parts, one plant with sterile part at top of stem, plants with sporangia on sterile portion, one plant 12½ inches tall.

Forma GRACILE (House) Weatherby. Several found with type.

Forma PALMATUM Milde. A few found with type.

BOTRYCHIUM LANCEOLATUM Angstr. var. ANGUSTISEGMENTUM Pease & Moore. Two stations, one in moist mountain valley, the other in moist cut-off woodland, s.e. of Fleetwood. One station, found a number of years ago, under grapevines, on a dry slope, has disappeared. Rare.

BOTRYCHIUM OBLIQUUM Muhl. A number of stations in level woodland, on stony slopes, and moist bottoms, especially along old woods roads and trails. Fairly common. One specimen somewhat approaching *B. obliquum* var. *tenuifolium* (Underw.) Gilbert.

Forma ELONGATUM (G. & H.) R. Hoffm. Occasional.

Forma OBLONGIFOLIUM (E. W. Graves) Clute. (*B. obliquum* var. *oblongifolium* E. W. Graves). Occasional. My specimens were identified by Mr. Graves.

Forma **pennsylvanicum** (E. W. Graves) n. comb. (*B. obliquum* var. *pennsylvanicum* E. W. Graves). Occasional. Dr. E. T. Wherry applies the name *Botrychium obliquum* var. *pennsylvanicum* to the original type of *B. obliquum*, but I believe it to be distinct. My specimens were identified by Mr. Graves.

Fruiting plants were found of each of these three forms. Intermediate forms and forms of *B. obliquum* more serrate than usual were found.

BOTRYCHIUM DISSECTUM Spreng. A number of stations, frequently with *B. obliquum*. Fairly common. Some specimens are more finely or more coarsely dissected than others. Found a small sterile frond, in excellent green condition, with a very short abortive fertile growth near base, on June 10, 1936. Found a specimen on July 17, 1936, with a sterile frond of 1936 and the sterile frond of 1935, yellow, but otherwise in fairly good condition, the fruiting part not yet fully developed. One dwarf plant, with only a few broad, incised segments, apparently a

sport. Specimens were found which are laciniate only along the edges of the lobes or pinnules, the laciniations, however, consisting of the rectangular segments toothed or notched at the end, characteristic of *B. dissectum*.

BOTRYCHIUM MULTIFIDUM (Gmel.) Rupr. var. ONEIDENSE (Gilbert) Farwell. (*B. dissectum* Spreng. f. *oneidense* (Gilbert) Clute.) One station, near Umbrella Hill, about 2 mi. w. of Kutztown. Rare. Woodland slopes.

Because of its broadly and short-triangular terminal segments, with other segments generally oblong or oval, and its tendency to remain green during the winter, I prefer to accept the decision of E. W. Graves and others to place this plant under *B. multifidum*. Segments of typical *B. obliquum* are generally narrowly ovate or lance-ovate.

BOTRYCHIUM MULTIFIDUM (Gmel). Rupr. var. INTERMEDIUM (D. C. Eaton) Farwell. (*B. multifidum* (Gmel.) Rupr. ssp. *silaifolium* (Presl) Clausen.) One station near Umbrella Hill, about 2 mi. w. of Kutztown, another on e. end of Hageman's Head, South Mountains, about 2½ mi. s.e. of Fleetwood. Rare. In general the bases of at least the outer segments are oblique and more or less decurrent. One specimen has segments obtusely ovate rather than oval. Woodland slopes.

This is the southernmost reported station for this *Botrychium* in Pennsylvania. One specimen from the first station was sent to Dr. Clausen who pronounced it a lax shade form of *B. multifidum* ssp. *silaifolium*, not typical; but later specimens from the first station and the specimens from the second station are practically true to type.

BOTRYCHIUM VIRGINIANUM (L.) Sw. Moist woodland and on drier slopes. Common. One plant with sterile part bifid and one of the divisions again bifid, one plant

with double fertile part. Several plants probably of the so-called var. *gracile* (Pursh) Lawson.

OPHIOGLOSSUM VULGATUM L. Two stations, one on grassy slope w. of Fleetwood, the other on border of moist woodland on South Mountains, s.e. of Fleetwood. For a few years the writer had several plants of this species growing in his fern garden. In recent years no specimens have been found near Fleetwood. Rare. Have no specimens in herbarium.

OSMUNDA REGALIS L. var. SPECTABILIS (Willd.) Gray. A few stations in wet hollows in South Mountains; a few plants on right bank of dam in Moselem Creek, 3½ mi. n.w. of Fleetwood. Occasional.

OSMUNDA CLAYTONIANA L. Several stations, usually on moist woodland slopes. Fairly common. One small plant with pinnules round-oblong and overlapping.

OSMUNDA CINNAMOMEA L. In wet mountain hollows. Common. One specimen with pinnae more widely separated than usual.

Forma FRONDOSA (Torr. & Gray) Britton. In writer's fern garden.

Forma LATIPINNULA Blake. Single plants at two stations.

Forma BIPINNATIFIDA Clute. No specimens in herbarium. The one found was sent to Prof. W. N. Clute (1913).

Forma INCISA (J. W. Huntington) Gilbert. No specimen in herbarium. The one found was sent to Mr. L. S. Hopkins (1914).

ONOCLEA SENSIBILIS L. Low open grounds or wet places in open woodland. Common.

Forma **acutisegmenta** f. nov., segmentis acute profundeque incisis. The pinnae or segments are deeply and acutely cut and lobed. At one station, near iron bridge e. of Kutztown, in low, swampy ground, with hundreds of

plants, a large proportion of the plants are of this form. Type in writer's herbarium.

PTERETIS NODULOSA (Michx.) Nieuwl. One station, on right bank of dam in Moselem Creek, 3½ mi. n.w. of Fleetwood. Rare.

WOODSIA ILVENSIS (L.) R. Br. One station, on right bank of Sacony Creek, 4 mi. w. of Kutztown, in clefts of rocks of hard shale. Rare.

WOODSIA OBTUSA (Spreng.) Torr. Rocks and stony banks, usually partly shaded. Common. One plant, growing on rock in open sunlight, has color and texture of *W. ilvensis.*

CYSTOPTERIS FRAGILIS (L.) Bernh. var. MACKAYII Lawson. Moist rocks and cliffs, stone walls, and shaded, usually stony banks. Common.

Most of my plants are fairly uniform in appearance, with the pinnules or segments widest above the middle, obtuse, often obovate and frequently rounded at the apex on vigorous or young growth or on sterile fronds; but several plants or colonies, identified as belonging to var. *Mackayii*, have been found with pinnules generally widest at base or below the middle, narrower, and obtusely oblong or oblong-ovate, although the young sterile fronds frequently bear segments like those of typical var. *Mackayii.* One colony of ferns, with very large sori and short rootstocks, growing in crevices of the sunny portion of the limestone wall of a small bridge, possibly is *Cystopteris fragilis* f. *magnasora* Clute.

CYSTOPTERIS BULBIFERA (L.) Bernh. One station on limestone cliffs on Forge Hill, at Charming Forge, Pa., about 30 mi. w. of Kutztown. One station (established by transplanting from the writer's fern garden) on Wagenhorst's Hill, near Kutztown. Rare. One frond with side branch.

DENNSTAEDTIA PUNCTILOBULA (Michx.) Moore. Rocky

and stony slopes and banks in the open and in open woodland. Common.

POLYSTICHUM ACROSTICHOIDES (Michx.) Schott. On rocky slopes in woodland, stony banks in open thickets, and sometimes in low, stony ground. Common. Occasional fish-tailed pinnae are found. One freak sterile frond with pinnae of upper half much reduced. Fronds with auricles on basal pinnae cleft to midrib and sometimes stalked.

Forma INCISUM (A. Gray) Gilbert. On rich woodland slopes or in low moist ground. Occasional. Some fronds were found on which the pinnae of the fertile portion are deeply incised or pinnatifid, as in forma *multifidum*, while those on the rest of the frond are merely serrate or only moderately incised.

The Christmas Fern is very variable in outline and the variations are frequently more common than the typical form. The margins of the pinnae of the type are finely serrate; but in some forms which the writer has frequently found, the margins are sharply and beautifully serrate, in others distinctly dentate with broad, erect teeth, while in still others there is a tendency toward a crenate margin. But, instead of coining a multiplicity of names for minor forms, these variations may as well be regarded as forms verging toward forma *incisum*, especially since there is practically a full line of intermediate gradations, many of which could not be placed definitely under any subdivision.

Forma CRISPUM Clute. Occasional.

Forma RECURVATUM Clute. Rather rare. Specimens intermediate between this form and the type were found.

Forma **ligulatum** f. nov. Frondes 13.5–24 cm. longae. 2–2.3 cm. latae, anguste ligulatae, nec ad apicem nec basin angustatae, nonnihil caeruleo-virides. Stipites quam laminae breviores, paleis pallide castaneis lanceolato-

ovatis, paleis linearibus intermixtis. Rachis paleis multis attenuatis instructa. Pinnae 0.9–1 cm. longae, densae, breviter petiolulatae, interdum auriculo brevi in latere superiore, in lobos duos valde recurvatos longitudinaliter incisae, sic formam crispam producentes, suborbiculares apparentes et in planta viva et in herbario (at si pinnae evolverentur oblongo-ovatae essent et saltem dimidia longiores quam dimensiones supra datae). Margines leviter serratae vel subintegrae, setis paucis vel pluribus. Prope Kutztown, Pennsylvania, 1937.

Fronds 7–9½ in. long, ¾–⅞ in. wide, linear or ligulate, not tapering toward either end. Rather bluish green. Stipes a little shorter than the length of the blades, with a number of light brown, lance-ovate scales, interspersed with numerous linear scales. Rachis beset with narrow scales. Pinnae about ⅜ in. long, very short-stalked, crowded, especially in upper part of frond, cleft lengthwise into two acute lobes which are strongly recurved, giving the frond a ruffled appearance; occasionally slightly auricled on the upper side; suborbicular in appearance on the growing and on the pressed frond (but if the pinnae would be flattened out they would measure at least 1½ times the dimensions given and would be oblong-ovate in shape). Margins with a few to many bristles, shallowly serrate to almost entire. Near base of stony, wooded hillside, one mile n. by e. of Kutztown, Pa. A very distinct form, based on a single plant with three fronds, all sterile. Mr. Weatherby informs me that an unnamed specimen of this form, from Vermont, is in the Gray Herbarium. Type in writer's herbarium.

FLEETWOOD, PENNSYLVANIA.

(To be continued)

Selaginella rupestris (L.) Spring in Arkansas[1]

DWIGHT M. MOORE

The occurrence in Arkansas of *Selaginella rupestris* (L.) Spring appears to have been a matter of uncertainty in years past. More recent field work and collections will serve to settle the question.

In 1860 Lesquereux (1) reported this species in Arkansas on "sandstone—dry rocky places," and Branner & Coville, 1891 (3), included it in their list of plants of the state, but attributed it to Lesquereux. However, Harvey, 1881 (2), did not list it and Buchholz, 1924 (4), after examining herbarium material in the larger herbaria of the country, concluded that "there was no authentic Arkansas material" on which to base a report of its presence in the state.

Since that time it has been collected in six different counties. (See map.)

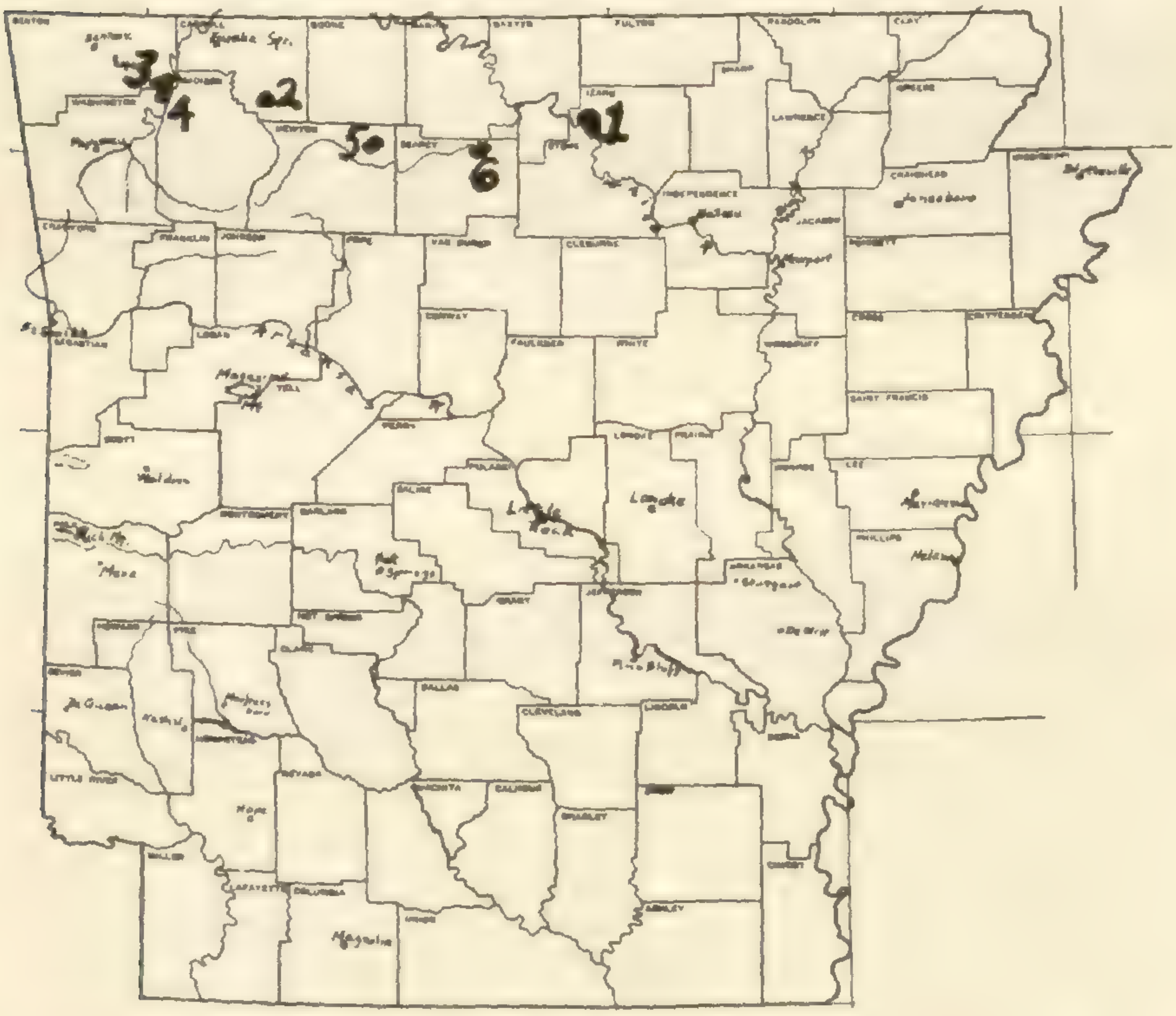
The first authentic collection in Arkansas was made by Delzie Demaree at Calico Rock, Izard County, Arkansas, in 1927, on the sandstone outcrops above the hotel in that town. Since that time, the writer has found it abundantly in similar habitats in several places within a radius of five miles of this station. Further extensions of the range have been made by the writer as follows.

In 1931 a small station was found on a sandstone ledge about twelve miles south of Berryville and one mile north of Metalton in Carroll County. In 1933 it was found on extensive sandstone outcrops in the southeast corner of Benton County. Here it occurs over an area two or three miles long, extending also into the northeast corner of Washington County. In this area the Sylamore sandstone is cut through by the White River and forms abrupt

[1] Research Paper No. 650. Journal Series. University of Arkansas.

cliffs along the river about one hundred feet high. It is in the thin sandy soil on the edges and exposed surfaces above that the *Selaginella rupestris* occurs. Here it is usually associated with *Polytrichum* sp., *Cladonia* spp. and often with *Talinum parviflorum*, *T. calycinum*, *Sedum pulchellum* and *S. Nuttallianum*.

Two further stations were added to these in 1935. One



of these was on the St. Peter sandstone outcrops above Marble City Falls in Newton County and the other on similar outcrops above Buffalo River in the northern part of Searcy County. Here the river passes between massive cliffs (see Plate 3) up to 500 feet high, capped with St. Peter sandstone on which the *Selaginella* is found, sometimes on the apparently bare rock and at others in thin sand or in crevices between strata.

Search for this plant has been continued in other likely

places. such as Magazine Mountain, but as yet without success.

In all of the stations for this interesting plant in the six counties it has been found on dry sandstone or associated with it. This confirms the report made nearly 80 years ago by Lesquereux and clears the doubt expressed by Buchholz in 1924. It also suggests that further study may disclose much more of interest concerning the plants of Arkansas.

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(2) Harvey, F. L. 1881. Ferns of Arkansas. Bot. Gaz. 5, 6: pp. 189–190; 213–215.
(3) Branner, John C., and F. V. Coville. 1891. A List of the Plants of Arkansas in the Annual Report of the State Geologist.
(4) Buchholz, John T. 1924. Notes on Arkansas Pteridophytes. AMER. FERN JOURNAL 14: pp. 33–38.

Cyrtomium in Southern California

H. H. TRACY

While collecting in the San Gabriel mountains of southern California, the writer's son came across a plant that appears to be a species of *Cyrtomium*. The appearance of this Asiatic fern in such a wild locality is so unique as to deserve mention.

In his paper on "The Genus Cyrtomium" in the JOURNAL[1] Christensen refers to *C. falcatum* (L.) Presl as follows: "One species (*C. falcatum*) is one of the most important commercial ferns, which thrives well in dwelling rooms and, in the southern States, is no doubt hardy

[1] Christensen, Carl. "The Genus Cyrtomium" AMER. FERN JOURN. 20: 41. 1930.

Buffalo River Cliffs in Searcy County (No. 6 on Map). The Habitat of Selaginella rupestris.

in the open air and to be found here and there as an escape from gardens.'' Under the description of this species, he gives the distribution as: Southern Japan, Korea, Formosa, Eastern China (Shantung to Chekiang); the distribution in continental Asia is still not finally delimited. . . . It is sometimes found as an escape from gardens in warmer countries, for inst., ALABAMA: Mobile (*E. W. Graves* No. 1253); FLORIDA: St. Augustine (*P. O. Schellert* 1923); MOLOKAI, Hawaiian Islands (*Degener and Wiebke* No. 3217, U. S. Nat. Herb.).

Two other instances of the occurrence of the Japanese Holly Fern in the United States have been recorded recently. Mrs. Florence C. Hubbard[2] mentions two escaped plants growing in an old well in Cromwell, Connecticut. Dr. R. C. Benedict[3] alludes to his having seen, several years ago, the Holly Fern ''apparently well established near Orange, New Jersey. . . .''

Dr. Christensen, in his key, refers to *C. falcatum* as having the margin of the pinnae fully entire and the terminal pinna the largest. Although my specimen does not agree completely, it seems to fit more closely to *C. caryotideum microptcris* Kunze than it does to *C. falcatum*. As can be seen by the photograph, the terminal pinna is much the smallest, the margins are decidedly toothed, and a slight tendency to form auricles is seen.

The station here referred to is difficult of approach. A rugged canyon two and one-half to four miles above the nearest human habitation terminates in a waterfall with a thirty foot drop. Above the falls an even more narrow gulley leads off to the left. A small stream makes its way down the gulley and around a fifteen foot boulder, to join the larger creek going over the falls. It was upon a ledge running across this boulder, eight feet from the

[2] AMER. FERN JOURN. 21: 76. 1931.
[3] AMER. FERN JOURN. 23: 63. 1933.

A Frond of the California Cyrtomium.

ground, that the single plant of *Cyrtomium* was found. In the crevice near it were a few plants of *Adiantum capillus-veneris* and a single medium-sized plant of *Woodwardia chamissoi.*

Fifteen to twenty dead fronds were still attached to the rootstock. There were only four green or partially green fronds, the plant evidently having produced only one or two fronds each year. Probably because of the unfavorable growing conditions, the number of pinnae was smaller (eight to ten) than that cited by Dr. Christensen for *C. falcatum.*

The isolated position of this plant is certainly intriguing. Many cultivated plants of *Cyrtomium* are to be found in the gardens of Southern California. These are sold as "Holly Ferns" or by scientifically inclined nurserymen as *Cyrtomium falcatum.*

FULLERTON, CALIFORNIA.

Notes on Texas Ferns

H. B. PARKS

If one interested in nature will travel from Austin, Texas, through San Antonio and Uvalde, and to Del Rio, he will note shortly after leaving Austin that toward the north lies what appears to be a range of mountains, and toward the south an undulating plain. This "mountain range" seems to increase in height as one approaches San Antonio, and to increase further as one approaches the vicinity of Uvalde. From this city on to Del Rio the mountain range approaches the road, thus lessening its apparent height. This range is the southern edge of the Edwards Plateau, designated on maps either as the Edwards or the Balcones Escarpment. The average height of the Plateau above the Gulf plain to the south is approximately twelve hundred feet. In this south-

facing scarp the various formations of the Lower Cretaceous Period are exposed. As these formations slope toward the south, they carry much of the underground water from the Edwards Plateau and Great Plains.

This constant supply of water reaches the surface in the numerous springs and seeps that are so common along the Escarpment. The most noted springs in Texas, which have the dimensions of rivers issuing from solid rocks, are found at the base of the Escarpment. This mountain wall was the shore line of the Eocene ocean. Land erosion and wave action formed the numerous deep canyons that cut into this wall of limestone. Many of the limestone layers are porous and ground water, instead of issuing in springs, forms seeps which cover large acreages. This area, nearly two hundred miles in length, is one of the finest fern locations in the United States. There is scarcely a ravine or bluff which is not a veritable fern garden, due to the fact that the ground water furnishes a perpetual supply to the faces of the bluffs, and the prevalent southeast winds, during rainy periods, drench these same faces with warm water. These same winds also carry the seeds of many semi-tropical plants as well as spores of ferns. It is notable that along the southern face of this Escarpment there grow many plants that are found nowhere else in the United States, and that they are of southern affinities.

In a recent paper G. M. Soxman, of Dallas, Texas, gave an account of a visit to a locality where Edgar T. Wherry collected *Adiantum tricholepis* Fee,* giving the information that this fern still exists in the vicinity and that new localities were found within a few miles of the place designated by Wherry. Since that time the known localities have been extended about fifteen miles further to the west. This fern, it is to be remembered, was first

* THIS JOURNAL 29: 120. 1939.

reported in Texas from the mouth of the Pecos River. Although no one in recent times has collected the fern in that locality, it is of interest to note that the locality itself has the same qualifications for the growth of the ferns and is located where the Edwards Escarpment crosses the Rio Grande River.

Some five or six years ago the writer became aware of the fact that many plants found only in extreme West Texas or in north-central Mexico occurred in a narrow strip of territory along the Edwards Escarpment in Medina, Kerr, and Kendall Counties. The finding of *A. tricholepis* strengthened the belief that the southern face of the Escarpment should be the home of many other species of southern plants whose wind-borne seed could find a lodging place in the wet canyons of this wall.

Knowing of the discovery by E. J. Palmer of *Tectaria heracleifolia* (Willd.) Underw. in the vicinity of Montell* and of the collection by Mrs. Young of *Cheilanthes leucopoda* Link in Uvalde Canyon, an expedition was decided upon to see if these ferns still existed. In preparing for the trip, V. L. Cory secured the name of the hotel keeper to whom Palmer referred and was fortunate in locating the man, who now is in charge of the ranch on which the sink-hole described by Palmer is located.

September 24, 1939, V. L. Cory and the writer went to Montell and from there to the ranch house of C. C. Meriwether. Mr. Meriwether was very glad to lead this little expedition to the sink-hole. He stated that he knew nothing of Palmer's visit to the place, nor did he know of anyone else who had gone there after ferns. Our guide led us along the same road traveled by Palmer, as this is the only one that has ever led up Montell Canyon. We left the road at the beginning of the cedar brake mentioned in the Palmer article. Mr. Meriwether

* THIS JOURNAL 24: 104. 1934.

thought that this was about as far as we could drive, owing to the fact that the brake had been burned over. As we left the bed of the canyon and gained the upland ahead of us there seemed to be miles of one of the most terrible terrains one could imagine, not a green thing, red, burned soil, bare limestone, and the whole area covered with partially burned cedar trees. It appeared almost impossible to traverse this flat, even afoot, but by judicious driving and lifting of burned tree trunks we were able to reach the base of the mountain on which the sink-hole occurs.

Here was a good-sized water course which was dry. From the very base to the top there was scarcely any vegetation. The face of the bluff was about five hundred feet high, the ledges of rock protruding like huge steps. Everything edible had been consumed by the numerous sheep and goats on the ranch. As we climbed the sides of the mountain along a goat trail, dried specimens of many species of ferns were seen to protrude from cracks in the walls. It seems evident that goats and sheep do not relish ferns. About two-thirds of the way up the side of the mountain is exposed a layer of the so-called skeleton rock. This is limestone which has been under water for such a period of time that all of the soft particles have been dissolved and been carried away, giving the rock a peculiar corroded and porous appearance. The cavities range from microscopic dimensions up to several feet in diameter; and on this ledge were numerous tufts of *Cheilanthes leucopoda* which, in drying, had assumed the appearance of a loosely constructed pine-cone, and were of a striking light brown color. They are so abundant as to give that color to the entire face of this skeleton rock.

Going almost to the top of the hill, we came to a shelf of the rock twenty to thirty feet in width and extending

for some distance along the face of the bluff. Here we left the path and went some little distance downward to the widest part of the platform. If this is the same sink-hole which Palmer visited, the brush and cactus which marked its mouth have disappeared. The mouth of the sink-hole in the floor of the platform is about four feet long and not over eighteen inches in width at its widest place. Because of its position, the sun does not shine into the opening more than about an hour a day.

Looking into the hole until our eyes became accustomed to the darkness, we saw there below what resembled seaweed floating under water; we had found the *Tectaria*. Knowing nothing of conditions inside, we hunted some dead tree trunks from which the sap-wood and branches had long since disappeared. On lowering these into the hole, the bottom was reached at about six feet. Mr. Cory and Mr. Meriwether went down through the hole and reported that the ferns were present in great abundance but nowhere did they grow more than four to five feet from the place where the sunlight could reach the bottom of the crevice. It appears that the hole was caused by a cave-in, and the fallen rock forms a mound on which the ferns grow. Numerous young ferns grew along the walls almost up to the orifice. This sink-hole leads downward to a pool of water, and tradition has it that water was commonly obtained here by the Indians.

After having secured a number of fern specimens without molesting the roots of the plants, the return trip was started. Some of the dried specimens of *C. leucopoda* were collected and the expedition returned Mr. Meriwether to his home. The entire trip lasted only about three hours; we established the fact that the colony of *Tectaria* still is in existence, and will probably occupy that location for many years to come, as it is so well protected from everything but a plant collector. *Cheilanthes*

leucopoda is not only common but also grows to quite large size. It, too, will persist as it can grow in dry locations and is not readily eaten by live stock. During our trip, which lasted through the remainder of the day, almost every species of fern accredited to central and western Texas was observed. They occurred in numbers, but were in very poor condition due to the long drought. In this connection it should be noted that the term "Uvalde Canyon" as used by Mrs. Young in her reports on plants, and especially ferns, refers to all of the little canyons which open into the Nueces River Valley north of the City of Uvalde.

As yet the Lindheimer station for *Tectaria* has not been located, but it is known to have been somewhere on the south slope of the Edwards Escarpment.

In the vicinity of Rock Springs there exists what is known as the Devil's Sink Hole. This sink-hole is a cavity caused by the falling in of the roof of a cave, the opening being nearly one hundred feet in diameter. From the surface one can see that the cavity was once dome-shaped and that the roof, in falling, has formed a mound in the center. The top of this cone-shaped mound is about 150 feet below the present level of the soil and its base is known to be surrounded by deep water. Fifty feet below the surface a ledge of rock constantly wet with seeping water encircles this wall. This whole ledge is abundantly covered with ferns. It is strongly suspected that among these ferns *Tectaria* is present, in quantity. An investigation of this locality will be undertaken early in 1940.

TEXAS AGRICULTURAL EXPERIMENT STATION

Recent Fern Literature

A posthumous article by Professor Schaffner, in collaboration with Liang-Ching Li, has been published in China. It treats the nine species of *Equisetum* known in that country, giving a key and for each species a description, general range, citation of specimens (mostly in Old World herbaria) and brief comment.

Six of the species are also American and well known to most of us; the other three, *E. ramosissimum*, *E. debile* and *E. diffusum*, are exclusively Old World, though American plants have been mistaken for the first. Of these, *E. ramosissimum* is the commonest Chinese species, *E. debile* is widely distributed in southern China, and *E. diffusum* is found only in the western and southwestern parts of the country. *E. arvense* is also reported as common, but the other American species are rather rare and mostly occur in North China only.[1]

Dr. Wherry has published a paper on "Notable Pennsylvania Ferns." He points out that, though it is well known that *Asplenium ebenoides*, *A. pinnatifidum* and *Dryopteris intermedia* were discovered in that state by R. R. Scott, Nuttall, and Muhlenberg respectively, it is not so well known that *Lygodium palmatum* was also discovered by Muhlenberg and that, in the early 18th century, Bartram sent to Europe specimens which were figured by Dillenius in 1741 and became the basis (or part of it) for *Lycopodium obscurum* and of that part of the original *L. complanatum* which is now set off as var. *flabelliforme* or *L. flabelliforme*.

Dr. Wherry also comments on 12 species which have range-limits in one direction or another in Pennsylvania.[2]

[1] Schaffner, J. H., and Liang-Ching Li. Chinese species of *Equisetum*. Bull. Fan Mem. Inst. Bot. Ser. 9: 125–134 (1939). This is probably the last thing Prof. Schaffner wrote; the manuscript was mailed to his Chinese colleague only two days before his death.

Mr. J. B. Lewis and Prof. A. B. Massey have compiled a carefully annotated list of 30 species and varieties of fernworts known to occur in Amelia County, Virginia, most of them collected by Mr. Lewis. Amelia County is in the Piedmont and the list should give a good idea of what ferns one may expect in that region.[3]

Mr. S. L. Meyer has published a brief account of the fernworts (13 species) found in a mountain bog in Virginia. Incidentally, the lady fern, even in its broadest sense, is hardly "cosmopolitan," as he calls it; and the particular form he mentions, *Athyrium asplenioides,* is confined to the southeastern United States.[4]

Shorter Notes

DISTINGUISHING BETWEEN BOTRYCHIUM OBLIQUUM AND BOTRYCHIUM DISSECTUM.—In looking over earlier numbers of the FERN JOURNAL, I came across an article (AMER. FERN JOURN. **11**(4): 116) entitled, "Is *Botrychium dissectum* a Sterile Mutant?" One part of this was written by Mr. L. S. Hopkins. Mr. Hopkins asks, "If dissectum is a valid species, will some one please tell us just how deep the laciniations must be to make it so?"

Evidently the distinction depends not upon the depth but upon the character of the laciniations. Mr. E. W. Graves, in his article on "Describing Botrychiums" (AMER. FERN JOURN. **25**(4): 117) says: "*Botrychium dissectum* Spreng. can always be distinguished from *B. obliquum* by its lobes being cut into rectangular seg-

[2] Wherry, E. T. Notable Pennsylvania ferns. Proc. Pennsylvania Acad. Sci. **11**: 52–54 (1937).

[3] Lewis, J. B., and Massey, A. B. Ferns and fern allies of Amelia County, Virginia. Virginia Journ. Sci. **1**: 26–29 (1940). The Virginia Journal of Science succeeds Claytonia.

[4] Meyer, S. L. Pteridophyta of a bog near "White Pine Lodge," Giles County, Virginia. Virginia Journ. Sci. **1**: 29–30 (1940).

ments, notched or dissected at the end. This is never true of *obliquum;* its lobes may be evenly notched, but are never deeply cleft into rectangular segments." I do not know whether this distinction had ever been noted before Mr. Graves stated it, but in all the plants I have found it is a reliable method for identifying *obliquum* and *dissectum.*

On December 12, 1939, I found two *Botrychiums* rather deeply laciniate only along the edges of the lobes. There were the rectangular segments, notched at the ends, mentioned by Graves. Clearly these should be placed under *dissectum.* I have a specimen just like these in my herbarium. But I have in my herbarium also another *Botrychium* specimen, deeply serrate, almost incised, but in this specimen the teeth or segments are not rectangular but sharply and often narrowly triangular, hence it belongs under *obliquum.* I am labeling one of my specimens as "*Botrychium dissectum* form less dissected than usual," the other as "*Botrychium obliquum* form more deeply serrate than usual."—C. L. GRUBER, *Fleetwood, Pa.*

A CORRECTION.—Due to an error in copying, I reported *Trichomanes Petersii* A. Gray (AMER. FERN JOURN. 29: 142. 1939) from Georgia as follows: "Georgia: Walker Co., '2.5 miles northwest of Lafayette, April 24, 1938. Pyron and McVaugh No. 2751' (also from Dade County and Tallulah Falls)." The specimens from Walker and Dade Counties are *Cheilanthes alabamensis* (Buckl.) Kunze. *Trichomanes Petersii* is represented from Georgia only by the A. B. Seymour collection from Tallulah Falls, July 19, 1901 (U. S. National Herbarium and N. Y. Bot. Gard. Herbarium).—DONOVAN S. CORRELL, *Botanical Museum, Harvard University.*

AN OSMUNDA HYBRID.—Several peculiar specimens of *Osmunda* recently came to my attention which, upon close inspection, seemed undoubtedly to be hybrids between *O. regalis* var. *spectabilis* and *O. Claytoniana*. Superficially these specimens resemble one of the many aberrant forms that are not rare in the genus *Osmunda*. Actually, however, they have some characters of the former species, some of the latter, and some intermediate between the two. Also many of the spores and sporangia are abortive. I have been unable to find any reference in the literature to hybrids in the genus *Osmunda*.

× OSMUNDA **Ruggii,** n. hybr., (*O. Claytoniana L.* × *regalis* L. var. *spectabilis* (Willd.) Gray) lamina bipinnata; pinnis ad rachin articulatis, basi breviter pubescentibus; pinnularum marginibus integris; pilis longis fulvis inter sporangia gestis.—CONNECTICUT: Wilton, June 14, 1931, *L. J. Bradley*; same locality and collector, June 19, 1933 (herb. E. H. Eames no. 11,553), plate 5; from garden of H. G. Rugg, Hanover, New Hampshire, June 20, 1934, TYPE in the Gray Herbarium (plant transplanted from garden of Mr. Huss, Hartford, Conn., presumably collected near by in Connecticut according to Mr. Rugg), plate 6.

I take pleasure in naming this new fern after Mr. Rugg, who first noticed its peculiarities.

In the type specimen the fertile pinnae are borne in the middle of the blade and the vegetative pinnae at the top are somewhat abnormal, and bear a few sporangia. The forking of the veins is quite variable, but there are never as many twice-forked veins as in *O. regalis* var. *spectabilis*. The characters of the hybrid and its parents are presented in the following table:

O. regalis var. *spectabilis*	× *O. Weatherbiana*	*O. Claytoniana*
Fertile pinnae borne terminally.	Fertile pinnae borne terminally or in the middle of the blade.	Fertile pinnae borne in the middle of the blade.
Base of pinnae articulate, glabrous.	Base of pinnae articulate, short-pubescent.	Base of pinnae not articulate, pubescent.
Pinnules short-stalked, at most only the 3 terminal ones confluent.	Pinnules sessile, from 5–7 of the terminal ones confluent.	Pinnae deeply pinnatifid.
Veins mostly forked twice.	Many, usually most of the veins forked once.	Veins forked once.
Margin of the segments finely serrate.	Margin of the segments entire.	Margin of segments entire.
A few short, black hairs, or none, among the sporangia.	Long hairs among the sporangia, at first white, later brown.	Long hairs among the sporangia, at first white, later brown.

R. M. TRYON, JR., *Gray Herbarium, Cambridge, Mass.*

American Fern Society

The following report of the Labor Day field meeting was received by the editors late in January and could not be fitted into the first number for this year. We regret that it appears so tardily.

Whether it was the distance from metropolitan areas, or the Labor Day migrations, only three members of the society made the trip to Lake Shehawken, Wayne County, Pa.; Dr. Edgar T. Wherry, Dr. Robert T. Clausen, and the leader, W. L. Dix. Saturday afternoon was spent about the lake collecting *Isoetes Braunii*, various species of phaenogamous aquatics, and the pteridophyta to be found about the lake. The unusual station for *Polystichum Braunii* was also visited.

On Sunday a trip was made to the other station for *P. Braunii* on Shrawder Mountain. A stop was made on

×Osmunda Ruggii. Mr. Bradley's specimen, collected in the wild, showing leafy apex.

× Osmunda Ruggii. Type specimen, from Mr. Rugg's garden.

the way at Island Lake where Dr. Clausen collected among other Isoetes a single plant of *I. riparia*. On the shore of Lake Hiawatha the locality, where *Botrychium multifidum* had been found the previous year by the leader, was visited. Photographs of the plant were taken (by Dr. Wherry), as this locality represents quite a southerly range extension of this plant. At this same locality the variant *B. multifidum* ssp. *silaifolium* (Presl) Clausen was collected.

In a bog near Lakewood, about three miles south of Lake Shehawken *Dryopteris Boottii* and *D. cristata* were collected. Near here was found another specimen of *Botrychium multifidum*. A few miles further south, in Little Hickory Lake, were found *Isoetes Braunii*, and *Myriophyllum tenellum*. In a swamp between this lake and Bone Lake one of the highland stations for *Dryopteris simulata* was visited. This fern covers quite an extensive area here among *Rhododendron maximum* and *Osmunda cinnamomea*. At Bone Lake Dr. Wherry collected another Isoetes which he reports is *I. riparia*. These collections by Dr. Wherry and Dr. Clausen represent quite an extension of the supposed range of this Quillwort.

Monday morning a trip to the hills of Susquehanna County just beyond Starrucca was made with the hope of finding *Botrychium multifidum* in that County. Although none was found, an interesting station for *Mimulus moschatus*, previously found by Mr. Dix, was visited near Starrucca. Dr. Wherry has since reported that on his way home, just south of Thompson and about five miles south of Starrucca, he found some plants of *Botrychium multifidum*.

The objectives of this trip were to visit these new localities for *Botrychium multifidum*, and to secure photographs of them in their habitat. As two new sta-

tions for this fern were discovered (two since the trip by the writer) it is quite apparent that this species may have a more southerly range than was formerly supposed, and that it may be looked for in suitable localities in the mountains of northern Pennsylvania.—W. L. DIX.

A field meeting, with headquarters at Jacksonville, Florida, was held Jan. 2 and 3, 1940, under the able leadership of Mrs. W. W. Diddell.

The first day's journey was to Fort George Island at the mouth of the St. John River. This island appears to have been an immense oyster-bed from which the waters of the ocean have receded. It has upon it ruins of slave-houses and remains of other buildings that were constructed of oyster-shells and mortar. Rollins College has here a bird and plant sanctuary, presided over by our talented hostess.

The fern-lovers quickly discovered, in addition to the common *Dryopteris normalis*, *Asplenium platyneuron*, *Marginaria polypodioides*, and *Cheilanthes microphylla*. Interesting was *Psilotum nudum*, an epiphyte with its sporangia scattered along naked branches.

That evening the members of the Society gathered together for a most enjoyable dinner. Early the next morning we motored to the lime-sinks of Orange Lake, Williston, and adjoining areas.

Those of us who were familiar with the fern-growths of other lime-sinks in Florida were thrilled with the individual strangeness of those we visited on this trip. Each sink seems to have species of ferns peculiar to itself. The surrounding terrain seems destitute of any fern-life whatsoever. This serves to make the exploration of these caverns doubly fascinating.

The first pit we visited required the use of a series of ladders to enable us to reach its depths. Here, in addi-

tion to *Dryopteris normalis* and *D. setigera*, we obtained numerous specimens of *Pteris cretica Wilsonii*, *Asplenium Curtissii*, *A. abscissum* and *A. verecundum*, and a number of mosses.

At Williston the pits were not so deep. There we secured *Dryopteris augescens*, *Anemia adiantifolia*, *Goniopteris reptans*, and *Asplenium heterochroum*.

On the road from Ocala to Tampa, we found beautiful specimens of *Asplenium pumilum* clinging to the rocks, also *Polypodium plumula* and *Asplenium platyneuron*.

In another section, we descended into a large sink from which we entered an immense cave. Here we obtained *Dryopteris setigera*, *Asplenium verecundum* and *A. abscissum*.

None of these sinks yielded any specimens of *Tectaria heracleifolia*, or the many variations of *Pteris multifida* and *P. cretica* which I had obtained on a journey of the previous year to the sinks near Istachatta, a few miles away.—EDMUND LEROY DOW, *Palm Beach, Florida*.

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To the members of the American Fern Society:

You have now all received a copy of the Index to the first 25 volumes of the JOURNAL of your Society. The planning, directing the compilation of, and final editing of this Index was an exceeding arduous undertaking, but I was happy to be able to carry it out so as to make more

useful to all of us the store of interesting and valuable information on ferns contained in these volumes. However, many members who have joined in more recent years do not have in their libraries the earlier volumes. Please don't forget that the Society has complete sets for sale at a very low figure. By purchasing the volumes you lack, you will not only be obtaining for yourself a large amount of worth-while reading matter, but also will help the Society furnish to its members still more fern literature in the future.—EDGAR T. WHERRY.

The following extracts from letters to the Secretary may serve to supplement Dr. Wherry's note.

". . . three copies reached me yesterday. Am afraid I shall have to ask someone to lock them up so that I can have the Journal only evenings. They are just what I have searched for."

"I've had the Society in mind since the May issue of 1925 of the Geographic—'Ferns as a Hobby' by William R. Maxon—and if I get as much good out of the Journal as I do from my ferns—well, I'll go places."

Only, we hope that not every newcomer will wait as long as the second gentleman before trying the Journal.

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C. A. WEATHERBY

R. C. BENEDICT W. R. MAXON

CONTENTS

Ferns and Fern Allies of South Carolina ..... Velma D. Matthews 73
Hybrid between Polystichum braunii and P. acrostichoides ..... R. H. Thompson and R. L. Coffin 81
Ferns and Fern Allies of the Kutztown-Fleetwood Area, Pennsylvania ..... C. L. Gruber 89
Pilularia in Texas ..... C. LaMotte 99
Recent Fern Literature 102
Shorter Notes: Azolla filiculoides on Long Island; a Correction 103
American Fern Society 104

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American Fern Journal

VOL. 30 JULY–SEPTEMBER, 1940 NO. 3

The Ferns and Fern Allies of South Carolina

VELMA D. MATTHEWS

In 1914 Miss Laura M. Bragg published a list of the ferns from the coastal region of South Carolina, which included 22 species represented by specimens in herbaria.[1] This is the most complete list which has been published for the state.

In the present paper the writer attempts to list by counties all the species of Pteridophytes which have been collected in South Carolina and are represented by specimens. A map is presented to show the number of species which have been collected in each county. A dot indicates a species, but one dot may represent a great many different collections. Unfortunately, no collections have been made in a few of the counties and the number of collections is small in others. The writer has taken short trips through several of these counties without making any collections. However, if one knew all the undisturbed areas one would undoubtedly find a number of species in every county. Perhaps others will soon collect specimens to fill in the gaps. Up to the present time 68 species with several varieties and forms are known from South Carolina. There are reports in the literature and

[Volume 30, No. 2 of the JOURNAL, pages 41–72, plates 3–6, was issued June 23, 1940.]

[1] Bull. Charleston Museum 10: 17, 1914; republished with additions in this JOURNAL 4: 83, 1914. Other notes on South Carolina ferns have appeared in this JOURNAL 11: 90, 1921; 24: 99, 1934; 26: 127, 1936; 28: 115, 1938; and 29: 73, 1939.

in manuals of several other species, but so far no specimens of them have been seen.

This paper would not have been possible without the cooperation and assistance of a large number of people, and the writer wishes to take this opportunity to express her appreciation to some of them. Dr. W. C. Coker has made suggestions, furnished specimens, and provided facilities for working at the Highlands Biological Laboratory. Dr. Edgar T. Wherry has supplied data as to habitats, valuable records from several herbaria on the distribution of many species, and other material. Miss Alma Holland and Dr. H. L. Blomquist have read and made suggestions for the preparation of the manuscript. The following have generously made collections available for examination, furnished general information, and aided in field-work: Dr. J. H. Barnhart, Mr. Milby Burton, Dr. Robert T. Clausen, Dr. H. A. Gleason, Mr. Norman R. House, Dr. S. A. Ives, Mr. Wm. A. Knight, Dr. W. R. Maxon, Dr. P. J. Philson, Mr. H. A. Smith, Mr. F. G. Tarbox, Jr., Miss Elizabeth A. Williams, and Mr. G. L. Wittrock. My associates at Coker College, Mr. Willard Hewitt, Mr. B. E. Smith and Dr. Elizabeth Davidson, and my students have collected with me on many trips.

The citations of specimens are made with the following abbreviations for the herbaria: "A"—The Academy of Natural Sciences, Philadelphia, Pa.; "B"—Bailey Hortorium; "C"—Converse College; "CC"—Coker College; "Ch."—Charleston Museum; "Cl."—Clemson College; "D"—Duke University; "G"—Gray Herbarium; "F"—Furman University; "M"—Missouri Botanical Garden; "N.C."—University of North Carolina; "NY"—New York Botanical Garden; "P"—University of Pennsylvania; "Pr."—Princeton; "S.C."—University of South Carolina; "US"—United States National Herbarium.

MAP OF SOUTH CAROLINA, SHOWING THE DISTRIBUTION OF PTERIDOPHYTES BY COUNTIES. A DOT REPRESENTS A SPECIES.

PTERIDOPHYTA

Order 1. OPHIOGLOSSALES

Family 1. OPHIOGLOSSACEAE Adder's-Tongue Family.

1. BOTRYCHIUM Sw.

1. BOTRYCHIUM ALABAMENSE Maxon.

Alabama Grape-Fern.

Moist woods and fields; autumnal. Counties. GREENVILLE: Jamison Mill Creek 4 miles northwest of Gowensville, *Wherry* (A). PICKENS: Easley, *Fullbright* (F).

2. BOTRYCHIUM BITERNATUM (Savigny) Underwood.

Southern Grape-Fern.

Pastures and woods in the coastal plain; vernal. Counties. AIKEN: Aiken, *Ravenel* (C, G). CHARLESTON: Charleston, *De Witte* (NY). RICHLAND: Columbia, *Taylor* (G, NY).

3. BOTRYCHIUM DISSECTUM Spreng.

Cut-leaved Grape-Fern.

Moist, shaded, low woods; autumnal. Counties. GREENVILLE: Jamison Mill Creek 4 miles northwest of Gowensville, *Wherry* (A). LANCASTER: Forty-acre Rock. *Matthews* (CC). PICKENS: Easley, *Clausen* and *Trapido* (B, CC), *Fullbright* (F).

4. BOTRYCHIUM OBLIQUUM Muhl.

Coarse-lobed Grape-Fern.

Moist woods and pastures; autumnal. Clausen and others consider this as a variety of *B. dissectum*. The form which has been given the name *B. obliquum* var. *tennifolium* is more abundant than the typical *B. obliquum*. Counties. ANDERSON: Anderson, *Davis* (A). BEAUFORT: Bluffton, *Mellichamp* (US); Dale, *Gibson* (CC). BERKELEY: northwest of Bellisle school, *Clausen* and *Trapido* (B, CC). CHARLESTON: Bulow Mines. *Mat-*

thews (CC). CHEROKEE: Gaffney, *Matthews* (CC). DARLINGTON: Society Hill (Pr.); Lauther's Lake, *Matthews* and *Smith* (CC). EDGEFIELD: Edgefield, *Josey* (CC). FLORENCE: along Black Creek, *Matthews* and *Smith* (CC). GEORGETOWN: near Brookgreen, *Matthews* and *Hewitt* (CC); Georgetown, *Tarbox* (US). GREENVILLE: bank of Matthews Creek, *Wherry* (A). GREENWOOD: Greenwood, *Lawrence* (CC). HORRY: south of Myrtle Beach, *Matthews* (CC). LANCASTER: Forty-acre Rock, *Matthews* (CC). OCONEE:—*Anderson* (US); Jocassee, *Correll* and *Barksdale* (D). ORANGEBURG: Eutaw Springs, *Matthews* and *Hewitt* (CC). PICKENS: near Easley, *Clausen* and *Trapido* (B, CC). RICHLAND: southwest of Columbia, *Smith* (US). SUMTER: Poinsett State Park, *Matthews* (CC); Wateree River swamp, *Holdaway* (D).

5. BOTRYCHIUM VIRGINIANUM (L.) Swartz.

Rattlesnake Fern.

Moist shaded woods; vernal. Counties. ANDERSON: Anderson, *Davis* (A, G). BERKELEY: near Moncks Corner, *Leeds* (A), *Wherry* (A), and *Matthews* (CC); Pinopolis, *Matthews* (CC). CHARLESTON: Otranto, *Webber* and *Bragg* (Ch.). CHESTER: south of Chester, *Caldwell* (CC). DARLINGTON: Lauther's Lake, *Coker* (CC). GREENVILLE: Vaughan's Gap, *Peattie* (NC); north of Greenville, *Loomis* (A); Paris Mt.—(CC). HORRY: south of Myrtle Beach, *Matthews* (CC). LANCASTER: Forty-acre Rock, *Matthews* (CC). MCCORMICK: McCormick, *Matthews* and *Fooshe* (CC). ORANGEBURG: Eutaw Springs, *Matthews* and *Hewitt* (CC). PICKENS: Round Top Mt., *Correll* (D). RICHLAND: Columbia. *Philson* (CC).

2. OPHIOGLOSSUM L.

1. OPHIOGLOSSUM CROTALOPHOROIDES Walter.

Adder's-Tongue Fern.

Moist pastures and pine woods. No recent collections of this species have been made in South Carolina. Dr. Clausen doubtfully referred Nuttall's specimens from South Carolina at the Academy of Natural Sciences in Philadelphia to this species; but see remarks under #2 below. Ravenel's specimen at the Charleston Museum has on the label "S. C. in light soil, pine woods.". However, the specimen at Converse College gives Pinopolis (Berkeley County) as the locality and the date as February.

2. OPHIOGLOSSUM NUDICAULE L. f. (*O. tenerum* Mett.)
Adder's Tongue.

Damp open savannahs of the same type as that where one finds *Lycopodium adpressum*. Thanks are due to Dr. Clausen for the identification of the Dillon collection. Dr. Wherry compared specimens of this collection with those of "*O. pusillum*" Nutt. collected by Nuttall in South Carolina in 1818 and reports that they are an "exact match." Counties. DARLINGTON: Grass plot in Coker College Arboretum, Hartsville, *Matthews* (CC). DILLON: Damp open savannah, with *Lycopodium adpressum*, 3.7 miles north of Dillon city limits on right side of highway #9, *Matthews* and *Smith* (CC, A, NC, B, D).

Order 2. FILICALES

Family 1. HYMENOPHYLLACEAE Filmy Fern Family.

1. HYMENOPHYLLUM J. E. Sm.

1. HYMENOPHYLLUM TUNBRIDGENSE (L.) J. E. Smith.
Tunbridge Filmy Fern.

Shaded granitic or gneissoid rocks. For a report of the recent discovery of this fern by Mrs. Mary S. Taylor see the Journal of the Elisha Mitchell Scientific Society **54**: 345. 1939. Counties. PICKENS: on a large rock in

a deep gorge in Pickens County, *Taylor* and *Coker* (NC, CC); on vertical face of a small rock ledge, *Wherry*, *Benedict*, and *Correll* (A).

2. TRICHOMANES L.

1. TRICHOMANES BOSCHIANUM Sturm.

American Bristle-Fern.

On moist shaded rocks, usually on overhanging surfaces. Counties. OCONEE: Tomassee Falls, *H. D. House* (A).

2. TRICHOMANES PETERSII A. Gray. Dwarf Filmy Fern.

On damp shaded rocks, usually on vertical faces. Counties. PICKENS: on rocks in a deep gorge in Pickens County, *Taylor* (D, NC); same location, *Taylor* and *Coker* (NC, CC); on rocks in gorge of Eastatoe Creek, *Wherry*, *Benedict*, and *Correll* (A).

Family 2. OSMUNDACEAE Cinnamon Fern Family.

OSMUNDA L.

1. OSMUNDA CINNAMOMEA L. Cinnamon Fern.

Moist woods, fields, and swamps. This fern is probably present in every county of the state. Counties: Aiken, Allendale, Anderson, Bamberg, Beaufort, Berkeley, Charleston, Cherokee, Chester, Chesterfield, Clarendon, Colleton, Darlington, Dillon, Dorchester, Florence, Georgetown, Greenville, Hampton, Horry, Jasper, Kershaw, Lancaster, Lee, Lexington, Marion, Marlboro, Oconee, Pickens, Richland, Spartanburg, Sumter, and Williamsburg.

2. OSMUNDA REGALIS L. Royal Fern.

Moist woods, swamps, and fields. Counties: Aiken, Allendale, Anderson, Beaufort, Berkeley, Charleston, Cherokee, Chesterfield, Clarendon, Colleton, Darlington,

Dillon, Florence, Georgetown, Greenville, Hampton, Horry, Jasper, Kershaw, Lee, Lexington, Marion, Marlboro, Oconee, Richland, Sumter, and Williamsburg.

Family 3. SCHIZAEACEAE Curly Grass Family.

1. LYGODIUM Sw.

1. LYGODIUM JAPONICUM (Thunb.) Sw.

Japanese Climbing Fern.

Moist woods along streams. Escaped from cultivation. Counties. DORCHESTER: Summerville, *Correll* (D, NY); *Matthews* and *Hewitt* (CC); *Trudell* (A). RICHLAND: Columbia, *Martin* (Ch.). SUMTER: 10 miles south of Sumter, *Coker* (NC).

2. LYGODIUM PALMATUM (Bernh.) Sw.

American Climbing Fern.

Moist banks and shaded woods. Counties. DARLINGTON: on the banks of a drainage ditch at edge of town of Hartsville on highway #35 going south, *Matthews* and *Smith* (CC). GREENVILLE: Caesar's Head, *Ravenel* (Ch.).

(*To be continued*)

A Natural Hybrid between Polystichum braunii (Spenner) Fée and P. acrostichoides (Michx.) Schott.

R. H. Thompson and R. L. Coffin

In delving through fern literature one finds many notes and articles about hybrids between species of the Wood-fern group, but so far no mention of a hybrid or the possibility of hybridization between the Christmas fern and Braun's Holly-fern has come to the attention of the authors of this paper. Since a remarkably clear hybrid of these two species was found by them and because of the presumable possibility of such a hybrid occurring anywhere in the overlapping zone of distribution of the two ferns, it was felt that a description of the hybrid accompanied by photographs would be of interest to all fern students.

In August, 1937, the authors and two other friends spent ten days in a camping trip in the Green mountains. The two friends hiked from the Canadian line to Mt. Mansfield while the authors remained in the vicinity of Smuggler's Notch to find and photograph the different ferns of the region.

It was while walking along a stream-bed in the Notch that the hybrid was discovered. It was growing on a shrubby hummock about a foot above the actual bed of the stream. Within one to five feet of it were several plants of typical Braun's Holly-fern and later investigation disclosed many plants of Christmas fern twenty-five to thirty feet away, higher up on the bank.

The habit of growth of the hybrid is very similar to that of the Christmas fern and not at all like that of Braun's Holly-fern; that is, the hybrid, as does *P. acrostichoides*, sends up numerous fronds in a dense clump that masks the crown. *P. braunii*, on the other hand, gen-

Hybrid above; P. braunii below.

erally produces five to eight fronds from the outside of a distinct crown. It may produce many more fronds (sometimes as many as 25–30), but the fronds always flare out to give a narrow or broad urn-shape to the plant as a whole and the upper surface of the fronds is more or less fully exposed. The hybrid plant, as a whole, is smaller than the Christmas fern. The mass of fronds of the hybrid is so like that of *P. acrostichoides* in habit that one continues on by, but with a feeling that all is not as it should be. He returns to look more closely and finds many resemblances in the plant to each of its parental species.

In the picture in which entire fronds of *P. acrostichoides*, the hybrid and *P. braunii* are compared, one sees that in outline the blade of the hybrid is shaped like that of the Christmas fern. The pinnae leave off abruptly at the base as in the Christmas fern, not continuing in diminishing size down the rachis as in Braun's Holly-fern. That is, one might say that the hybrid, like the Christmas fern, has a distinct stipe of some length and not a very short or almost indeterminate stipe like Braun's Holly-fern. The fronds of *P. braunii* normally taper from the middle toward both ends. The fronds of both the hybrid and the Christmas fern attenuate gradually toward the tip and very slightly to the abrupt cessation of pinnae at the base of the rachis.

The next most obvious point that one sees is that the fronds of the hybrid are of the same shining, dark green as those of *P. braunii*. Also, the pinnae of the hybrid are like those of *P. braunii* in being noticeably incised and spiny at the tips of the pinnules. In general they are not as deeply incised, being pinnatifid for the most part. At the base of the hybrid pinna there may be distinct pinnules, generally limited to the lower margin of the pinna, and a gradation from that condition through pinnatifid to merely incised. The pinnae thus

P. ACROSTICHOIDES. THE HYBRID. P. BRAUNII.

approach the condition of those of *P. acrostichoides* var. *Schweinitzii* (Beck) Small. In typical Braun's Holly-fern the upper basal pinnule of a pinna is quite large and the rest grade smaller from it. In the hybrid the corresponding pinnule is noticeably larger than the rest. From a comparison of the hybrid fronds with an equal number of typical Braun's Holly (the Braun's fronds taken at random) the apparent enlargement of the basal pinnule in the hybrid seems to be the result of a suppression of the size of the remainder of the pinna. This marked difference in size between the basal pinnule and the rest of the pinna in the hybrid gives the pinna a very similar shape to those of the Christmas fern—a half-halberd-shape. The comparative size of the pinnules on the upper and lower margins of the pinna also adds to this similarity. In Braun's Holly-fern, discounting the large upper basal pinnule, the pinnules may be of equal size on each side of the midrib, or, as is generally the case with the pinnae in the middle region of the frond, the pinnules on the lower side of the midrib are larger than those on the upper. On all the hybrid pinnae the pinnules on the upper side of the midrib are the larger. On the Christmas fern pinnae the blade on the upper side of the midrib is slightly wider than that on the lower side. This difference in size is much more marked in the hybrid as can readily be seen in the picture in which the upper portions of the fronds of the three plants are compared. The attenuation of the pinnae is variable, within limits, in both the Christmas fern and Braun's Holly-fern, but, as can be seen in both pictures comparing the three fronds the pinnae of the hybrid attenuate more nearly like those of the Christmas fern.

The frond of the hybrid as a whole tapers toward the tip as does the fruiting frond of the Christmas fern, though the fertile pinnae of the hybrid are not as reduced

as those of the Christmas fern. Fertile and sterile fronds alike of Braun's Holly-fern taper from the middle toward both ends. In all cases seen, only the upper third of the hybrid frond bears sori, as in the Christmas fern. In typical Braun's Holly-fern sori are quite frequently borne on pinnae as far down as the middle of the frond and even below the middle. In the picture comparing the fertile portion of the three fronds it is the upper third in each case that is fertile.

The arrangement of the sori is another point of comparison. On Braun's Holly-fern the sori are generally in two rows on the upper basal pinnule of the pinna and in a single row on each of the rest of the pinnules. But, on the pinnae near the tip of the frond they are more commonly in two rows the length of the pinna with one sorus at the base of each pinnule. On the Christmas fern they are in two rows the length of the pinna with occasionally a third short row parallel to these on the lower half and two short rows on the basal lobe. On the hybrid plant the sori are in two distinct rows the length of the pinna as in the Christmas fern and the upper pinnae of Braun's Holly-fern, but there may be sori scattered on the pinnules also.

The color of the fruit-dots is very different between Braun's Holly and the Christmas fern; those of Braun's Holly being dark-brown to black because of the dark-brown, shining sporangia and those of the Christmas fern being light-brown or buff because of the light-brown sporangia. The sporangia and likewise the sori of the hybrid are light-brown like those of the Christmas fern.

In comparing the chaffiness of the three the hybrid again takes an intermediate condition. It is quite chaffy at the base of the stipe like Braun's Holly-fern but sparingly so along the rachis. The Christmas fern is sparingly soft-chaffy along the rachis, though variable in this

respect, while Braun's Holly-fern is markedly soft-chaffy. This difference between the three is brought out somewhat for the upper part of the rachis in the picture comparing the upper part of the three fronds. These are ventral surfaces so do not show the difference really well.

Pressed fronds of the hybrid were compared with herbarium material of *P. aculeatum* (Sw.) Roth, since Braun's Holly-fern was at one time classed as var. *braunii* of that species. They were also compared with material of *P. Dudleyi* Maxon, *P. lemmoni* Underw. and *P. californicum* (D. C. Eaton) Underw. The points of difference between the hybrid and Braun's Holly-fern are of even more marked contrast between it and the first three species cited. Likewise its similarities to Braun's Holly-fern separates it completely from *P. californicum*.

The hybrid plant bore sixteen fronds of which one was forked two-thirds of the length. This may or may not be of any morphological value since forking occurs widely in typical-appearing species of ferns, but it is also of frequent occurrence in hybrid ferns. In the habit picture of the hybrid plant the two upper fronds, pointing forward and appearing smaller than the rest of the fronds are the two branches of this forked frond. One other plant was seen which seemed also to be a hybrid of these two ferns though not to such a striking degree. This plant, as a whole, grew like that of Braun's Holly-fern and of the five fronds on it only one showed an unmistakable intermediate condition.

AMHERST, MASSACHUSETTS.

Ferns and Fern Allies in the Kutztown-Fleetwood Area, Berks County, Pennsylvania

C. L. GRUBER

(*Continued from p. 49*)

DRYOPTERIS MARGINALIS (L.) A. Gray. Rocky and stony slopes in woodland, on rocks, and on partly open stony banks. Common. Specimens with forked fronds, one small frond ternately divided, one plant with fronds with crowded and overlapping pinnae, one frond with no pinnae on lower half of one side, very small fruiting fronds from dry shale cliff, one plant with two normal fronds and two freak fronds only two to three inches wide, a number of plants with pinnules more prominently auricled at base, frequently on both sides.

Forma **Traillae** (Lawson) n. comb. *Lastrea marginalis* β *Traillae* Lawson, Edinburgh New Phil. Journ. **19**: 275 (1864). *Nephrodium marginale*, forma *tripinnatifidum* Clute, Fern Bull. **15**: 21 (1907); **19**: 50 (1911). *N. marginale*, forma *Traillae* (Lawson) Clute, *l.c.* *Dryopteris marginalis*, forma *tripinnatifida* (Clute) Weath. AMER. FERN JOURN. **26**: 61 (1936). Fairly common.

Forma ELEGANS (J. Robinson) F. W. Gray. Occasional. Tripinnatifid, with the basal pinnule on the lower side of the lowest pinna longer than the others.

DRYOPTERIS MARGINALIS × SPINULOSA Slosson. One station in Smoketown Hollow, $1\frac{1}{4}$ mi. s.e. of Bowers, another in mountain hollow s.e. of Flint Hill, beyond Lyons. Rare. One specimen with forked frond.

DRYOPTERIS FILIX-MAS (L.) Schott. This species has never been found as far south as Pennsylvania and can hardly be claimed as belonging to the Kutztown-Fleetwood area; but in 1912 I purchased a plant of *D. filix-mas* from a nursery and planted it in my fern bed, where it thrived and multiplied. And evidently from the spores

of this plant a young plant grew up close to the wall of a porch on the northeast side of the house, more than fifty feet from the parent plants. Today this is a full grown specimen of typical *D. filix-mas*. The fact that this plant perpetuated itself by spores more or less identifies it with the fern flora of this region.

DRYOPTERIS GOLDIANA (Hook.) A. Gray. One station on bank in stony mountain hollow on n.e. side of Guinther's Head, 1¼ mi. s.e. of Bowers. Rare.

DRYOPTERIS CRISTATA (L.) A. Gray. A few stations in wet mountain hollows e. & s.e. of Fleetwood. Occasional. A frond of *D. cristata*, sterile in form and position, but with a number of sori, was found by the writer (1908) and sent to Dr. Clute. See FERN BULLETIN **17**: 1, 23.

DRYOPTERIS CLINTONIANA (D. C. Eaton) Dowell. One station, in moist, stony mountain hollow, s.e. of Flint Hill, beyond Lyons. Three plants. Rare. This is probably var. *genuina* Wherry, but no fruiting fronds were found.

DRYOPTERIS BOOTTII (Tuckerm.) Underw. One station, in moist mountain hollow, on bank of mountain rill, 2 mi. s.e. of Fleetwood. Rare.

DRYOPTERIS SPINULOSA (O. F. Müll.) Watt. In damp woods and on moist stony banks, sometimes in drier situations at bases of trees and rocks. Fairly common. *D. spinulosa* and *D. intermedia* are occasionally found at the same station.

Var. FRUCTUOSA (Gilbert) Trudell. Rather rare.

DRYOPTERIS INTERMEDIA (Muhl.) A. Gray. On stony slopes and sometimes in moist situations in woods and on partly open banks. Fairly common. Have one specimen which appears somewhat skeletonized.

THELYPTERIS PALUSTRIS (L.) Schott var. PUBESCENS (Lawson) Fernald. In marshes and low moist ground and along borders of ponds and streams. Fairly common. One large stand in a swampy lowland on eastern side of

Kutztown, another along edge of pond a short distance below Kutztown.

Forma **frondosa** (Farwell) n. comb. (*Filix Thelypteris* f. *frondosa* Farwell). With type at second station mentioned above. Rare. One plant along Sacony Creek, ½ mi. above Kutztown.

Forma **serratipinnula** f. nov. Frondes bipinnatae, pinnulis prominenter serratis. Bipinnate with distinctly serrate pinnules. A number of this form at second station mentioned above. Type in writer's herbarium.

THELYPTERIS NOVEBORACENSIS (L.) Nieuwl. Usually on moist banks and slopes in open woods. Common. Found one plant in wet soil along mountain rill, in dense shade, with rich green fronds and very few or no reduced lower pinnae. One forked tip of frond.

Forma **fragrans** (Peck) n. comb. (*Dryopteris noveboracensis* f. *fragrans* (Peck) Burnham). Rare.

THELYPTERIS SIMULATA (Davenp.) Nieuwl. In and along sphagnum swamp, south side of South Mountains, about 2½ mi. s.s.e. of Fleetwood. Rare.

PHEGOPTERIS HEXAGONOPTERA (Michx.) Fée. In open stony woodland and wooded slopes, often in slightly moist locations. Fairly common. One forked frond, one with pinnae more widely separated than usual.

PHEGOPTERIS POLYPODIOIDES (L.) Fée. Two stations, one at base of hill in mountain hollow 2½ mi. s.e. of Fleetwood, in rich, moist soil; the other in crevices of a shale cliff in the first railroad cut east of Virginville. This situation apparently is very dry, but there are evidences that a considerable amount of moisture probably is seeping down through the rocky bank. The plants at this station are much scalier than usual. Rare.

PHEGOPTERIS DRYOPTERIS (L.) Fée. Two stations, rich depression on north stony slope at base of Wagenhorst's Hill and bank at base of Umbrella Hill, near Kutztown. Rare.

ATHYRIUM ANGUSTUM (Willd.) Presl var. RUBELLUM (Gilbert) Butters. In moist woodland and on stony, partly open banks, sometimes in low rather clayey soil. Fairly common. Sometimes red-stemmed. One plant with dwarf ($8\frac{1}{2}$ inches tall), fully fruited fronds. Variable.

ATHYRIUM ANGUSTUM var. ELATIUS (Link) Butters. Several stations, in woods, usually somewhat moist, and along old woodland trails or on banks in open thickets. Occasional. A distinct variety.

A fully developed specimen of this variety, if held up toward the light, gives an impression of three ribs through the middle of the pinna, one seemingly formed on each side of the midrib by the elongated narrow basal segments on the upper sides of the pinnules overlapping the basal segment on the lower side of the next upper pinnule. The pinnules are sharply acute.

Transitional forms between these two varieties are found. Frequently, especially under *rubellum,* forms are found with the pinnae abruptly long-acuminate.

ATHYRIUM ASPLENIOIDES (Michx.) Desv. Several stations in moist woodland and rich partly open banks, sometimes in rather clayey soil. Fairly common. Red-stemmed and green-stemmed.

Forma SUBTRIPINNATUM Butters. Usually in low moist ground. Occasional. Frequently red-stemmed. Occasionally found with dimorphic fronds, especially on plants in open sunlight in my fern garden.

ATHYRIUM THELYPTEROIDES (Michx.) Desv. Several stations in moist, often rather open woods and along banks of streams. Fairly common. Fronds of plants in open sunlight in my fern bed became thicker and yellowish green. One specimen with the basal segments of the basal pinnae pinnatifid.

Forma **serratum** (Lawson) n. comb. (*Asplenium the-*

lypteroides β *serratum* Lawson). Segments prominently serrate. Occasional.

Forma ACROSTICHOIDES (Sw.) Gilbert. A few stations, one in Smoketown Hollow, $1\frac{1}{4}$ mi. s.e. of Bowers. Occasional. The segments in this form are usually more or less serrate, sometimes prominently so.

ASPLENIUM PLATYNEURON (L.) Oakes. Stony slopes and banks, usually in open woods and thickets, on rocks, and on stony, open banks on roadsides. Common.

Forma SERRATUM (E. S. Miller) Hoffm. Occasional on shaded or open stony banks. In some of my specimens the divisions of the pinnae are serrate or incised around the obtuse or broad tip.

Forma **incisum** (Howe) n. comb. (*Asplenium ebeneum*, var. *incisum* E. C. Howe.) One station, a number of plants in crevices of shale slabs on open roadside bank, $\frac{1}{2}$ mi. w. of Kutztown. Some pinnae are deeply incised or even pinnatifid, others merely strongly serrate. One specimen with frond forked at right angles near tip.

This is not forma *serratum*, as I know it, and it is not forma *Hortonae* (Davenp.) L. B. Smith; so, although forma *incisum* is today recorded as a synonym of forma *serratum*, I am referring my plants to forma *incisum* under the possibility that Howe's *incisum* is after all a separate and distinct form.

ASPLENIUM TRICHOMANES L. In crevices of rocks, usually in sheltered situations. Common.

ASPLENIUM RUTA-MURARIA L. var. CRYPTOLEPIS (Fernald) Christensen. One station, in crevices of wall of limestone bridge abutment and a few plants on rocks nearby, Stoudt's Ferry Bridge over Schuylkill River, about 8 mi. s.w. of Fleetwood. Rare. Some of my specimens are skeletonized, with barely enough green tissue to support the mass of sori underneath, others are deeply cut in linear segments around the apex of the pinnules.

ASPLENOSORUS EBENOIDES (Scott) Wherry. (×*Asplenium ebenoides* Scott.) One plant in crevice of cliff of hard shale, right bank of Sacony Creek, about 4 mi. w. of Kutztown. Rare.

CAMPTOSORUS RHIZOPHYLLUS (L.) Link. On limestone and other rocks and on stony banks, usually at least partly shaded. Found two colonies on granitic rock. A few specimens were found with slightly cut fronds, possibly approaching forma *Boycei* C. L. Wilson. Specimens with forked fronds.

ANCHISTEA VIRGINICA (L.) Presl. (*Woodwardia virginica* (L.) J. E. Smith.) Two stations, one in sphagnum swamp on south side of South Mountains, 2½ mi. s.s.e. of Fleetwood, the other in moist ground on summit of mountain, near Ludwig's school house, 1½ mi. s.e. of Fleetwood. Rare.

LORINSERIA AREOLATA (L.) Presl. (*Woodwardia areolata* (L.) Moore.) One station, in sphagnum swamp on south side of South Mountains, 2½ mi. s.s.e. of Fleetwood. At same station where *Dryopteris simulata* and *Anchistea virginica* are growing. Rare.

ADIANTUM PEDATUM L. In rich soil, on wooded, often stony slopes and banks. Common.

PTERIDIUM LATIUSCULUM (Desv.) Hieron. Dry open woods and gravelly slopes. Common.

Var. PSEUDOCAUDATUM (Clute) Maxon. In writer's yard.

A few plants were found which were very fragrant while young. These might be distinguished by a form name, just as the fragrant form of the New York fern is called forma *fragrans* under similar conditions; but the delightful odor seems to be caused only by a temporary seasonal condition.

Two plants were found with crisped or curly segments, shorter and more rounded than usual, and several plants

were found on which the segments were decidedly falcate or hooked. On one plant the segments of the upper half of the frond were falcate while the lower portion was normal; and this peculiarity seems to indicate that probably both the curly and the falcate segments are the result of some pathological condition.

PELLAEA ATROPURPUREA (L.) Link. In crevices of rocks, usually limestone or hard shale. One station in crevices of a wall of the ruins of an old building (Sally Ann Furnace). Fairly common. Specimens with forked pinnae and forked tip.

PELLAEA GLABELLA Mett. One station, in crevices of the abutment wall of Stoudt's Ferry Bridge across the Schuylkill River, 8 mi. s.w. of Fleetwood. On the east side of the bridge only *P. glabella* grows, in company with *Asplenium Ruta-muraria* var. *cryptolepis*; on the west side only *P. atropurpurea* is found. Rare.

CHEILANTHES LANOSA (Michx.) Watt. One station, growing rather plentifully on a number of hard shale rocks, on partly wooded bank, right bank of Sacony Creek, 4 mi. w. of Kutztown. Rare. At the same station where *Woodsia ilvensis* and *Selaginella rupestris* are found.

POLYPODIUM VIRGINIANUM L. On top of rocks, faces of cliffs, sometimes on stony banks, occasionally at or on bases of trees. Common. One specimen with forked tip and pinna, two fronds each with a fish-tailed pinna. Specimens approaching forma *elongatum* (Jewell) Fernald. A small frond with narrow, crowded pinnae.

Forma ACUMINATUM (Gilbert) Fernald. (*P. v.* forma *biserratum* (Millsp.) Broun.) Occasional on rocky banks.

EQUISETUM ARVENSE L. On sandy banks, on railroad embankments, sometimes in low moist ground or on stony, clayey flats, occasionally in moist open thickets.

Common. Rather variable in different situations. One specimen with branches only at the top and toward base of stem, none in the middle.

Forma PSEUDOSYLVATICUM (Milde) Luerss. With the type, especially among later growth. Fairly common.

Forma DECUMBENS (Meyer) Klinge. Usually on sterile banks, but occasionally along rich meadow borders. Fairly common in some locations.

Forma DIFFUSUM (A. A. Eaton) Clute. In similar situations as the above form. Occasional.

Forma NEMOROSUM A. Br. Usually along bases of moist shaded banks or in damp hollows. Occasional.

EQUISETUM PREALTUM Raf. Two stations, sandy bank along stream and meadow. Rather rare. A number of specimens with groups of small fruiting cones along upper part of stem.

EQUISETUM FLUVIATILE L. In water along margins of slow streams and in ponds, in muddy flats, and on banks of ditches. The most fruitful patches were found in a swampy lowland from which the water receded in late spring. Common near Kutztown.

Found stumps of this species, on May 15, 1936, immersed under five to ten inches of water, which were not winter-killed and from the joints of which new growth started. Found specimens, on October 18, 1935, fresh and green, with long, stout, stem-like branches from near the base.

Forma LIMOSUM (L.) Clute. (*E. f.* var. *limosum* (L.) Gilbert.) See FERN JOURN. **26** (3) : 92. (*E. f.* forma *Linnaeanum* (Döll) Broun.) Occasional with the type.

EQUISETUM SYLVATICUM L. var. MULTIRAMOSUM (Fernald) Wherry. One station, near Fleetwood reservoir, in upper part of moist hollow in open, elevated field, left side of road going up. A fine stand. Rare. Some distance below this is a good stand of *E. arvense*.

LYCOPODIUM LUCIDULUM Michx. Wet woods, in low ground, on banks and moist stony slopes, sometimes in drier situations. Common.

LYCOPODIUM FLABELLIFORME (Fernald) Blanchard. (*L. complanatum* L. var. *flabelliforme* Fernald). In sterile, often stony woods, on dry slopes or moister levels, sometimes along moist banks in the open. Common. One set of specimens with axis of cones projecting one-half to one inch beyond apex of cone, the projection with many acute scales. One specimen with only two fruiting cones; specimen with bifid cones, having approximately 5 or 6 cones; specimen with approximately 6 cones arranged racemosely or pinnately.

One colony of plants was found near Fleetwood, which in some characteristics resembles *L. flabelliforme,* in others *L. tristachyum.* No fruiting plants were found. Dr. Wherry informs me that specimens like these have been found in about ten counties in Pennsylvania. They deserve a varietal name.

LYCOPODIUM. OBSCURUM L. This is variety *genuinum* Wherry. In moist, usually stony woods. Fairly common.

Var. DENDROIDEUM (Michx.) D. C. Eaton. In stony woods and rocky or gravelly open woodland, often in drier situations than *L. obscurum* var. *genuinum.* Fairly common in a limited number of stations. Rarely fruiting in this area.

LYCOPODIUM CLAVATUM L. One station, on dry bank in rather open woods, upper level of South Mountains, near Herbein's Cut, s. of Fleetwood, near old iron ore mine. No fruiting specimens found.

SELAGINELLA APODA (L.) Fernald. In low, wet grounds. Occasional. The month of June, 1938, had an excessive amount of rainfall and during the summer a number of patches of this selaginella appeared in the lawn at a bungalow along Maidencreek, near Virginville. The

lawn was about four feet above the normal level of the stream and had been flooded twice during the rainy period.

SELAGINELLA RUPESTRIS (L.) Spring. One station, above and on ledges of hard shale rocks, on wooded slope along right bank of Sacony Creek, 4 mi. w. of Kutztown. Rare.

Among other ferns and fern allies in Berks County, *outside* of the Kutztown-Fleetwood area, one or more of the following persons, Mr. Leibelsperger, Mr. Wilkens, Mr. Brumbach, Dr. Berkheimer, and Mr. Nunemacher, have reported *Botrychium simplex* E. Hitchc. var. *tenebrosum* (A. A. Eaton) Clausen, *Athyrium pycnocarpon* (Spreng.) Tidestr., *Athyrium angustum* (Willd.) Presl var. *typicum* Butters, *Dryopteris Clintoniana* (D. C. Eaton) Dowell var. *australis* Wherry, *Asplenium pinnatifidum* Nutt., and *Isoetes Engelmanni* A. Br. Possibly there are two or three other species not yet definitely determined.

FLEETWOOD, BERKS COUNTY, PENNSYLVANIA

Pilularia in Texas

CHARLES LAMOTTE

A thick stand of *Pilularia*, most probably *Pilularia americana* A. Br., has been found in the flat, gravelly bed of a shallow creek just off the southeast foot of Granite Mountain, about one mile west of Marble Falls in the Llano Uplift region of Central Texas. Apparently this is the first station that has been found in the State. The species has for years been known to exist in the West Coast region from California to Oregon and in western Arkansas and central Georgia.

The scarcity of known stations does not necessarily mean that *Pilularia* is so limited in its distribution and abundance. The plant is a miniature thing, having an almost filamentous underground rhizome from which the tiny roots and leaves arise, the latter extending up through water or air an inch or so. These slender awl-shaped leaves are scarcely distinguishable from those of many young sedges and other semi-aquatic plants found in the same habitat. Indeed the author of this paper found it difficult to distinguish the *Pilularia* plants, without lifting them out of the soil, from the numerous small plants of *Isoetes lithophila* growing there. In this connection the following bit of personal experience may be of interest.

Since 1928 the writer has from time to time collected material of *Isoetes* for research and teaching purposes from Granite Mountain. In the summer of 1934, on one of these visits, he found that a prolonged drouth had caused all of the *Isoetes* plants to die down to their corms, thus leaving the spores mostly free in the soil. So he scooped up some soil and took it along for later separation of spores from the sand and debris. It so happened that during the following winter a fellow stu-

dent in the laboratories of plant morphology at the University of Illinois examined some of this material through mere curiosity and found a number of small seed-like structures which, upon careful examination, turned out to be sporocarps of *Pilularia!* It was not until the spring of 1938, however, that the writer had opportunity to return to Granite Mountain at a suitable time to find the plants in vegetative condition. Then, strangely enough, he searched for nearly two hours to find any specimens; and, upon retracing his steps after he did find them, he observed that he had trampled hundreds and perhaps thousands of specimens under foot before recognizing them. It is very likely, therefore, that this station for *Pilularia* would yet be unknown, even though quite frequently visited by botanists, had it not been for the curiosity of a young student of botany as to what he could find in a handful or two of gravelly soil.

Pilularia is closely related to the widely distributed pepperwort or four-leaf water fern, *Marsilea*, and like *Marsilea* it grows best in shallow water which maintains about the same level throughout a considerable growing season. Another related genus, known as *Regnellidium*, has been found in South America but not in North America. Its general features and structural details have recently been described by Johnson and Chrysler (Amer. J. Bot. vol. **25**, p. 141, 1938). Oddly enough, a *Marsilea* frond has four leaflets, *Regnellidium* has two, and *Pilularia* has none. A *Pilularia* frond appears, therefore, to be nothing more than a petiole or rachis, probably evolved by reduction from an ancestral form with leaflets. *Regnellidium*, then, would appear in this respect as intermediate between *Marsilea* and *Pilularia*, and Johnson and Chrysler (l.c.) have shown that it is intermediate in many other respects. All are heterosporous, however, and all manifest circinate vernation

in their young leaves. In this type of vernation they resemble the large-leaved ferns. All bear their spores in sporocarps, which are probably highly modified fertile pinnae enclosing the sori. These interesting sporocarps, the heterosporous habit of the plants that bear them, the greatly reduced, non-green prothallia, the speed with which the spores may develop into mature gametophytes —often in less than 24 hours—the peculiar fast-developing embryos with their cup-shaped haustorial organs for securing nourishment from their mother prothallia—all these and many other striking features combine to make this family a most fascinating one.

Where the family belongs in the phylogenetic "tree" is a question on which by no means all botanists agree. Perhaps it is best, however, to place it in the Filicales and to look upon it as a very highly specialized family of ferns. There is certainly considerable evidence that the *Marsileaceae* are not closely related to the other "water ferns" represented by *Salvinia* and *Azolla* and should not be classified with them as constituting an order of closely related families distinct from the Filicales.

Be that as it may, we now have another station for *Pilularia americana* where there is a great abundance of material when the spring growing season is favorable. April is probably the best month for an abundance of mature sporocarps.

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Recent Fern Literature

Mr. Warren C. Wilson gives, in the National Horticultural Magazine **19**: 39–43 (1940), a pleasant and accurate account of the common species of *Ophioglossaceae*, illustrated with excellent photographs of living plants in their natural habitats.

Mr. F. M. Abbey has given directions for growing a number of New England ferns. He has no time for such niceties as the correct spelling of latin names or the classification of the species concerned (he puts *Dryopteris cristata* and *D. marginalis* into *Polystichum*, while retaining *D. spinulosa* in *Dryopteris*), and one cannot but wonder if he really finds *Dryopteris cristata*, known to most of us as a swamp fern, along ledges in open woodlands. But he *has* grown the ferns in Vermont and in "ordinary garden loam soil"; and those who have gardens should get useful hints from his experience.[1]

Prof. Featherly and Miss Still (now Mrs. Russell) have issued a revised edition of their "Ferns of Oklahoma" (a notice of which may be found in the JOURNAL **24**: 115). The revision consists in the addition of one species (*C. castanea*) to *Cheilanthes* and of a useful sketch showing the difference between the scales of *C. Fendleri* and those of *C. Wootoni*, and in the bringing up to date of some of the nomenclature—a process unfortunately attended by such misspellings as "*resilians*" and "*felix-mas.*" It is rather a pity that the revision could not have been extended so that running rootstocks and sori would not be attributed to *Osmunda*; as it is, the virtues and defects of this convenient little manual remain much as they were.[2]

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[1] Abbey, Fred M. Our native ferns and their cultivation. Real Gardening 2: no. 3, 19–26 (1939).

[2] Featherly, H. I. and Russell, Clara Still. Ferns of Oklahoma. Oklahoma A. & M. College Exp. Sta. Circular 80 (revised) 1939. 24 pp., cuts.

Shorter Notes

AZOLLA FILICULOIDES ON LONG ISLAND.—Professor W. C. Muenscher[1] reported *Azolla caroliniana* Willd. as abundant in the Peconic River at Riverhead, Long Island, in the summer of 1938. Basis for this report was a field determination, seemingly justified by the fact that *A. caroliniana* was the only species of *Azolla* recorded from eastern North America. Since subsequent critical study of the specimens (*W. C. Muenscher and O. F. Curtis, Jr. 6646 and 6647*) from the Peconic River indicated that they were *A. filiculoides* Lam., they were distributed under that name. Evidence that the plant was probably introduced is afforded by the fact that two species from tropical America, *Anacharis densa* (Planchon) Marie-Victorin and *Myriophyllum proserpinacoides* Gill., are also naturalized in the Peconic River.

Torrey[2] reported *Azolla caroliniana* from a kettle-hole pond in Queens. From his description of the plants as ¼ to ½ inch long, the supposition is that they probably were *A. caroliniana*, but specimens seem not available to substantiate this report. For the separation of the two species of *Azolla*, the following key may be useful.

A. Plants 1–9 cm. long, much branched; leaves 0.8–1 mm. long; megaspores coarsely roughened; masses of microspores with non-septate glochidia ..... *A. filiculoides*

AA. Plants 0.5–3 cm. long, less branched than in A; leaves 0.6–0.8[3] mm. long; megaspores finely roughened or granulate; masses of microspores with septate glochidia ..... *A. caroliniana*

ROBERT T. CLAUSEN, *Bailey Hortorium, Cornell University, Ithaca, New York*

[1] Muenscher, W. C. Aquatic vegetation of Long Island Waters. Suppl. 28th Ann. Rep. N. Y. S. Conserv. Dept. Biol. Surv. XIII. pp. 88–101. 1939.

[2] Torrey, Raymond. *Azolla caroliniana* survives in Queens kettle-hole pond. Torreya **34**: 11–12. 1934.

[3] Leaves of some large specimens from South Carolina, recently examined, measured up to 1 mm. long.

Because of editorial lapses for which Mr. Tryon was in no way responsible, two errors appeared in his note on an *Osmunda* hybrid in the preceding number of the JOURNAL. On page 65, seventh line from the bottom, "type specimen" should read "Bradley specimen." As the illustration clearly shows, the type specimen has the fertile pinnae at the top. In the first line of page 66, *O. Weatherbiana* should, of course, read *O. Ruggii.* The former name was considered, but later discarded as unfitting in view of the fact that Mr. Rugg was the first to point out the peculiarity of the plant and that I discouraged him. But it was used in the tabular matter which was experimentally set up in advance of the rest of the note and, through my carelessness, was not changed when the two parts were put together for publication.—C. A. WEATHERBY.

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The JOURNAL is indebted to Mr. R. H. Thompson for defraying part of the cost of the illustrations accompanying the article on a hybrid of *Polystichum acrostichoides* and *P. Braunii.*

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EDITORS

C. A. WEATHERBY

R. C. BENEDICT W. R. MAXON

CONTENTS

Arkansas Pteridophyta ..... D. M. Moore 105
Ferns and Fern Allies of South Carolina (cont.) ..... V. D. Matthews 119
A Summer in Northern Europe ..... H. G. Rugg 129
Recent Fern Literature 132
Shorter Notes: Range Extensions in West Virginia; Additions to the Fern Flora of Lake Shehawken 136
American Fern Society 138
Index to Volume 30 140

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American Fern Journal

VOL. 30 OCTOBER–DECEMBER, 1940 NO. 4

Arkansas Pteridophyta[1]

DWIGHT M. MOORE

The Pteridophyta of Arkansas have received attention from naturalists and botanists for well over a century. From the observations of Thomas Nuttall in 1819 (1), down to the present, these plants have attracted the interest of many people and several lists have been published. The last complete list was published by Branner & Coville, 1891 (4), nearly half a century ago. Buchholz, 1924 (11), made some changes in and additions to this list. Buchholz & Palmer, 1926 (14), made several additions to the catalogue of Arkansas ferns which are here included for completeness. Some local studies have been made and published in various articles. Recently Scully, 1937 (23), and 1939 (25), has published lists of the ferns of the Hot Springs National Park region.

So much has been added to our knowledge of the ferns of Arkansas since the publication of the last complete list that it seems highly desirable to bring together this knowledge to date.

Among the interesting species that have been added to the list since Buchholz' notes (11) should be mentioned *Woodsia scopulina*. This fern, usually referred to as the Rocky Mountain Woodsia, was reported from Magazine Mountain by Palmer in 1924 (12). Other stations for

[1] Research Paper No. 450. Journal Series, University of Arkansas. The author has paid for extra pages necessary to print the whole of this paper in this number.

[Volume 30, No. 3 of the JOURNAL, pages 73–104, plates 8–10, was issued October 2, 1940.]

this fern in the East have been reported from time to time (18) but, as yet, there is only one station for it known in Arkansas.

A study of the various specimens of *Cystoperis fragilis* in the University of Arkansas herbarium discloses the fact that, in addition to the typical phase of the species, there are also several sheets which have been identified as var. *protrusa* Weatherby (21). These were collected in Benton, Washington and Hot Spring counties.

An unusual colony of *Dryopteris* was discovered in 1931, near Shirley, Van Buren County, by a party including E. J. Palmer, Delzie Demaree, and the writer. It was growing in a moist rocky wood associated with *Dryopteris marginalis*. Its sori, however, instead of being marginal, were midway between the margin and the midveins of the pinnules. It showed some resemblance to *D. clintoniana* and some to *D. celsa*. After considerable study it was designated by Dr. E. T. Wherry, 1937 (22), as *D. clintoniana* var. *australis*.

Dryopteris spinulosa had been reported by Lesquereux (2) and questioned by Harvey (3) and Buchholz (11). In 1924 this fern was found by the writer on the north slope of Magazine Mountain and reported by Buchholz and Palmer (14).

Dennstaedtia punctilobula was reported from Magazine Mountain by Palmer (12). It has also been reported from near Pine Bluff.

The Lady Ferns have been found in various parts of the state. But since Butters (9) has clarified this group, it appears that there are two of them in the state, viz: *Athyrium asplenioides* and its more divided form, forma *subtripinnatum*. The species is common in moist shady situations throughout the state, and the form has been recognized from three scattered stations but is probably more common that the records show.

There has been some uncertainty concerning the occur-

rence in Arkansas of *Athyrium angustum*. The specimens in the herbarium of the University of Arkansas which had been labelled by their collectors as this species have been examined by Dr. F. K. Butters who labels them *A. asplenioides*. However Dr. Scully (25) lists this species and, in a personal letter to the writer states that his material was determined by the late Dr. J. K. Small. On this authority this species is included in the present list.

Specimens distributed by Mr. E. J. Palmer under the label *Athyrium thelypteroides*, Hot Springs (#24513), were among those checked by Dr. Butters who designates them as *A. asplenioides*. Since other reports of this former species in the state are without supporting specimens, it is omitted from the list of Arkansas ferns until further evidence proves it present.

Scott's Spleenwort, that interesting hybrid between *Asplenium platyneuron* and *Camptosorus rhizophyllus* which Wherry has recently (23) designated as × *Asplenosorus ebenoides*, is reported associated with the two parents in many states. However, until recently, it had not been reported in Arkansas. In October, 1937, this was found by the writer in northern Crawford County on a cliff above Lee's Creek growing near both of the reputed parents.

Pellaea glabella was reported by Buchholz and Palmer (14) from Bella Vista, Benton County, and has recently been found at one other station along White River in Benton County.

Another interesting form of *Pellaea* was found by the writer near West Fork, Washington County. Its pinnae were mostly dichotomous and crowded toward the summit, and it has been identified as *P. atropurpurea* f. *cristata*, which apparently had previously been reported only from Eureka, Missouri.

Cheilanthes feei was first found in the state by Palmer in 1927 and since then has been collected by the writer in four counties, always on dry calcareous cliffs. Such rocks along Buffalo River afford an excellent place for this fern.

Adiantum capillus-veneris, which had previously been reported from only one station in Washington County, has now been found by the writer in several places in three counties, in the seepage from limestone.

Of the species of *Osmunda* only two have previously been reported, *O. cinnamomea* and *O. regalis* var. *spectabilis*. In June, 1926, Dr. John T. Buchholz, while stopping at the hotel at Freeman Springs, northern Pope County, observed some specimens of *O. claytoniana* L. in a vase and was told they had been collected near a spring at Sand Gap. He tried to locate the plants without success and also failed to get any of the specimens for herbarium records. Since that time he has made attempts and the writer has sought to locate this supposed station for this fern. After ten years these efforts met with success, when in June, 1936, the writer found a fairly large colony growing above a persistent spring 0.9 mile west of the store at Sand Gap (Pelsor Post Office), Pope County, growing near *O. regalis* and *O. cinnamomea* and several other ferns of like habitat. This find confirms Buchholz' observation and adds this species to the previous records.

Ophioglossum engelmanni has been reported from numerous stations, particularly on shallow soil on limestone outcrops. This fern usually occurs in rather dense groups. Reference to this feature has been made by Palmer (16). It seems that these have been considered numerous separate plants in spite of the fact that in Gray's *New Manual of Botany*, 7th edition (6) they have been described as "sometimes proliferous" from the slender, fleshy roots, although this habit is questioned for

another species in Britton & Brown's *Illustrated Flora*, (7). In digging some of these from a typical location near Green Forest when the soil was in good condition, it was observed that many of the roots showed budding plants and some even showed as many as four or five from the same root. Numerous observations at other stations prove that this is a common mode of multiplication in this region. Prince, 1918 (10), called attention to this same habit in adajacent Stone County, Missouri.

Marsilea vestita, previously reported for the state (11) but without locality, has been located in a small pool along Arkansas Highway #4 near the line between Bradley and Drew Counties.

Equisetum arvense, while of very common occurrence in the states to the north and east has never been reported in Arkansas. In the fall of 1935 this was found by the writer in a single locality in the northeast corner of Washington County among the seepage on the slope of a north-facing cliff along War Eagle Creek. It seems probable that it should be found elsewhere in the state.

Species of *Lycopodium* have long escaped discovery. In December, 1931, Dr. Flora A. Haas, of the Arkansas State Teachers College, found a specimen of *Lycopodium* in Saline County and sent it to the National Herbarium at Washington where it was identified as *L. adpressum* Lloyd & Underwood. This was reported by Dr. Haas at the meeting of the Arkansas Academy of Science, April 14, 1933. It is the only record of any species of *Lycopodium* in Arkansas.

Selaginella rupestris, which was questioned for the state by Buchholz (11), has been reported by the writer (26) from six counties of north Arkansas, always growing on dry sandstone outcrops.

Selaginella apoda, previously reported as *S. apus*, has been found in various wet situations in five other counties.

With the above changes and allowing for revisions in nomenclature, the number of Pteridophyta reported for Arkansas is now 67.

It is interesting to compare the number of different species and varieties reported in the various published lists:

1819—Nuttall (1)	23	1891—Branner & Coville (4)	47
1860—Lesquereux (2)	35	1924—Buchholz (11)	49
1881—Harvey (3)	39	1939—Present List	67

In the list which follows the nomenclature conforms to Broun's *Index to North American Ferns* (25). Synonyms are given only when the fern has previously been reported under, or is well known by, another name. With further study it is quite certain that the knowledge of both the species in the state and of their distribution will be greatly extended.

SYSTEMATIC LIST OF ARKANSAS FERNS

Class: FILICINEAE

Order I. FILICALES

Family 1. POLYPODIACEAE. Fern Family

1. ONOCLEA SENSIBILIS L. Sp. Pl. 1082. 1753. Sensitive Fern. Wet, muddy soil. Common.

2. WOODSIA OBTUSA (Spreng.) Torr. Cat. Pl. in Geol. Rep. N. Y. 195. 1840. Blunt-lobed Woodsia. Cliffs and banks. Common.

3. WOODSIA SCOPULINA D. C. Eaton, Can. Nat. II. **2**: 90. 1865. Rocky Mountain Woodsia. Found only on ledges on north side of Magazine Mountain, Logan County.

4. CYSTOPTERIS BULBIFERA (L.) Bernh. in Schrad. Neu. Journ. 1^2: 10. 1806. Bulblet Fern. Shady and moist rocky ledges and talus slopes. Nw.

5. CYSTOPTERIS FRAGILIS (L.) Bernh. in Schrad. Neu. Journ. 1^2: 26. 1806. Brittle Fern. Sheltered slopes and rock crevices.

6. CYSTOPTERIS FRAGILIS var. PROTRUSA Weatherby.

Rhod. **37**: 373. 1935. Moist, wooded slopes and rock crevices. Hot Springs, and Benton and Washington Counties.

7. DRYOPTERIS CLINTONIANA var. AUSTRALIS Wherry, AMERICAN FERN JOURNAL, **27**: 2, Pl. 1. 1937. Clinton's Shield Fern (southern variety). Moist rocky woods near Shirley, Van Buren County. Rare.

8. DRYOPTERIS CRISTATA (L.) A. Gray, Man. 631. 1848. *Aspidium cristatum* (L.) Sw. in Schrad. Journ. Bot. **1800**: 37. 1801. Crested Shield Fern. Swamps of Southeastern Arkansas.

9. DRYOPTERIS MARGINALIS (L.) A. Gray, Man. 632. 1848. *Aspidium marginale* (L.) Sw. Marginal Shield Fern. Rocky woods and ledges. Common.

10. DRYOPTERIS NOVEBORACENSIS (L.) A. Gray, Man. 630. 1848. *Aspidium noveboracense* (L.) Sw. New York Fern. Swamps near Hot Springs and probably southward.

11. DRYOPTERIS SPINULOSA (O. F. Müll.) Watt, Can. Nat. II, **3**: 159, 403. 1867. *Aspidium spinulosum* (O. F. Müll.) Sw. Spinulose Shield Fern. Found in only one locality on Magazine Mountain, Logan County.

12. DRYOPTERIS THELYPTERIS var. PUBESCENS (Lawson) A. R. Prince ex Weatherby, AMERICAN FERN JOURNAL **26**: 95. 1936. *Aspidium thelypteris* (L.) Sw. Northern Marsh Fern. Marshes, Washington and Little River County.

13. PHEGOPTERIS HEXAGONOPTERA (Michx.) Fée, Gen. Fil. 243. 1850–52. *Dryopteris hexagonoptera* (Michx.) C. Chr. Broad Beech Fern. Open rocky woods. Common.

14. POLYSTICHUM ACROSTICHOIDES (Michx.) Schott, Gen. Fil. Pl. 9. 1834. Christmas Fern. Woods and thickets. Common.

15. POLYSTICHUM ACROSTICHOIDES forma INCISUM (A.

Gray) Gilbert, List N. Am. Pterid. 19. 1901. *Polystichum acrostichoides* var. *schweinitzii* (Beck) Small. Bull. Torr. Club, **20**: 464. 1893. Found with the species, scattered.

16. DENNSTAEDTIA PUNCTILOBULA (Michx.) Moore, Ind. Fil. xcvii. 1857. *Dicksonia punctilobula* (Michx.) A. Gray, Man. 628. 1848. Hay-scented Fern. Rich, shaded woods, Magazine Mountain and Jefferson County.

17. ATHYRIUM ANGUSTUM (Willd.) Presl, Rel. Haenk. **1**: 39. 1825. Upland Lady Fern. Shady banks of streams or in low, rich woods. Hot Springs (Scully, 25).

18. ATHYRIUM ASPLENIOIDES (Michx.) Eat. Man. 122. 1817. *Asplenium asplenioides* (Michx.) D. C. Eaton. *Athyrium filix-foemina* var. *asplenioides* (Michx.) Farwell. Lowland Lady Fern, Southern Lady Fern. Swamps, moist woods and thickets. Throughout the state.

19. ATHYRIUM ASPLENIOIDES forma SUBTRIPINNATUM Butters. Collections from Harrisburg, Sand Gap, and Grassy Lake with the species.

20. DIPLAZIUM PYCNOCARPON (Spreng.) M. Broun, Index to North Am. Ferns, 1938. *Asplenium angustifolium* Michx. *Asplenium pycnocarpon* Spreng. Narrow-leaved Spleenwort. Cool, moist woods and calcareous talus slopes.

21. CAMPTOSORUS RHIZOPHYLLUS (L.) Link, Hort. Berol. **2**: 69. 1833. Walking Fern. Moist and mossy ledges or cliffs.

22. ASPLENIUM BRADLEYI D. C. Eaton, Bull. Torr. Club **4**: 11. 1873. Bradley's Spleenwort. Crevices of moist noncalcareous cliffs. Northwest Arkansas. Uncommon.

23. ASPLENIUM CRYPTOLEPIS Fernald, Rhod. **30**: 41. 1928. *Asplenium ruta-muraria* Am. auth. not L. Wall Rue. "Sheltered Limestone cliffs, Northeast Arkansas." Lesquereux (2). Rare.

24. ASPLENIUM PINNATIFIDUM Nutt. Gen. **2**: 251. 1818.

Pinnatifid Spleenwort. "Limestone cliffs, Northwest Arkansas." Scarce. Lesquereux (2), Harvey (3).

25. ASPLENIUM PLATYNEURON (L.) Oakes ex D. C. Eaton, Ferns of N. Am. **1**: 24. 1878. Ebony Spleenwort. Rich woods and rocky ledges. Common.

26. ASPLENIUM PLATYNEURON forma SERRATUM (E. S. Miller) Hoffman, Bost. Soc. Nat. Hist. **36**: 193. 1922. Var. *incisum* (E. C. Howe) B. L. Robinson. Often found with the species.

27. ASPLENIUM RESILIENS Kunze, Linnaea, **18**: 331. 1844. *Asplenium parvulum* Mart. & Gal. Mem. Acad. Brux. **15**: 60, pl. 15. 1842; not Hook. 1840. Blackstem Spleenwort, Smaller Spleenwort. Rocky ledges (chiefly limestone) Northwest Arkansas.

28. ASPLENIUM TRICHOMANES L. Sp. Pl. 1080. 1753. Maidenhair Spleenwort. Moist, sheltered caves and ledges, chiefly non-calcareous. Nw.

29. ×ASPLENOSORUS EBENOIDES (R. R. Scott) Wherry, AM. FERN JOURN. **27**: 56. 1937. ×*Asplenium ebenoides* R. R. Scott. Scott's Spleenwort. Found on rocky ledge on Lee's Creek, Crawford County, with *Asplenium platyneuron* (L.) Oakes and *Camptosorus rhizophyllus* (L.) Link, of which it is a proved hybrid but known to perpetuate itself in Alabama.

30. PELLAEA ATROPURPUREA (L.) Link, Fil. Sp. Hort. Berol. 59. 1841. Purple Cliff Brake. Calcareous outcrops. General.

31. PELLAEA ATROPURPUREA forma CRISTATA (Trel.) Clute, Fern. Bull. **15**: 47. 1907. Crested Cliff Brake. Calcareous outcrops. Westfork, Washington Co.

32. PELLAEA GLABELLA Mett. ex Kuhn, Linnaea, **36**: 87. 1869. Smooth Cliff Brake. Calcareous cliff above spring, Bella Vista and White River, Benton County. Rare.

33. NOTHOLAENA DEALBATA (Pursh) Kunze, Am. Journ.

Sc. II, **6**: 82. 1848. Powdery Cloak Fern. Dry, Calcareous rocks. Nw. Not common.

34. CHEILANTHES ALABAMENSIS (Buckley) Kunze, Linnaea, **20**: 4. 1847. Alabama Lip Fern. Calcareous rocks. Hot Springs and Northwest Arkansas.

35. CHEILANTHES FEEI Moore, Ind. Fil. 38. 1857. Slender Lip Fern. Dry calcareous cliffs. Rare. Northwest Arkansas.

36. CHEILANTHES LANOSA (Michx.) D. C. Eaton, in Torr. Rep. U. S. & Mex. Bound. Surv. **2**: 234. 1859. Hairy Lip Fern. Dry, usually calcareous rocks. Northwestern Arkansas.

37. CHEILANTHES TOMENTOSA Link, Hort. Berol. **2**: 42. 1833. Woolly Lip Fern. Dry, usually calcareous rocks. Western half.

38. ANCHISTEA VIRGINICA (L.) Presl, Epim. Bot. 71. 1851. *Woodwardia virginica* (L.) J. Sm. Virginia Chain Fern. Swamps of Southern Arkansas. (Nuttall).

39. LORINSERIA AREOLATA (L.) Presl, Epim. Bot. 72. 1851. *Woodwardia areolata* (L.) Moore. Dwarf Chain Fern. Swamps and wet woods, in very acid soil. Southeast half.

40. ADIANTUM CAPILLUS-VENERIS L. Sp. Pl. 1096. 1753. Venus-hair Fern. Wet limestone cliffs and calcareous springs. Scattered in northwest half of the state.

41. ADIANTUM PEDATUM L. Sp. Pl. 1095. 1753. Maiden-hair. Moist, rich woods throughout the state.

42. PTERIDIUM LATIUSCULUM (Desv.) Hieron. ex R. E. Fries, Wiss. Ergebn. Schwed. Rhod.-Kongo-Exp. **1**: 7. 1914. *Pteris aquilina* of American authors, in part, not L. 1753. Eastern Bracken. Dry open woods. Northwestern half of the state.

43. PTERIDIUM LATIUSCULUM var. PSEUDOCAUDATUM (Clute) Maxon, AM. FERN JOURN. **9**: 44. 1919. Found abundantly in Northwest Arkansas.

44. POLYPODIUM POLYPODIOIDES (L.) Watt, Can. Nat. II, 3: 158. 1866. Resurrection Fern, Gray Polypody. Mossy cliffs and tree trunks. Common.

45. POLYPODIUM VIRGINIANUM L., Sp. Pl. 1085. 1753. Common Polypody. Moist, mossy, non-calcareous rocks. Northwest.

Family 2. OSMUNDACEAE. Cinnamon-fern family

46. OSMUNDA CINNAMOMEA L. Sp. Pl. 1066. 1753. Cinnamon Fern. Swamps and wet woodland depressions.

47. OSMUNDA CINNAMOMEA f. FRONDOSA (Torr. & Gray) Britton, Cat. Pl. N. J. 312. 1890. Sandy, open woods, near Malvern, Hot Springs County. Rare.

48. OSMUNDA CLAYTONIANA L. Sp. Pl. 1066. 1753. Interrupted Fern. Damp, sandy soil above spring near Pelsor, Pope County. Rare.

49. OSMUNDA REGALIS var. SPECTABILIS (Willd.) A. Gray, Man. Ed. 2, 600. 1856. *Osmunda spectabilis* Willd., Sp. Pl. 5: 98. 1810. Royal Fern. Swamps and wet woodlands.

Order II. OPHIOGLOSSALES

Family 1. OPHIOGLOSSACEAE. Adder's-tongue family

50. OPHIOGLOSSUM ENGELMANNI Prantl, Bericht. Deut. Bot. Ges. 1: 351. 1883. Limestone Adder's Tongue. Thin, clay soil on calcareous flats. Nw and Sw.

51. OPHIOGLOSSUM VULGATUM L. Sp. Pl. 1062. 1753. Adder's Tongue. Wet Meadows. Sw and Se.

52. BOTRYCHIUM DISSECTUM Spreng. Anleit. Kennt. Gewachse, ed. 1, 3: 172. 1804. *Botrychium obliquum* var. *dissectum* (Spreng.) Prantl. Cut-leaved Grape Fern. Bottom-land woods. Fall. Washington County.

53. BOTRYCHIUM DISSECTUM var. TENUIFOLIUM (Underw.) Farwell, Papers Mich. Acad. Sci. 3: 89. 1924. *B. obliquum* var. *tenuifolium* (Underw.) Gilbert. McNab, Hempstead County.

54. BOTRYCHIUM DISSECTUM var. OBLIQUUM (Muhl.) Clute, Fern. Bull. **10**: 76. 1902. *B. obliquum* Muhl. Grape Fern.

55. BOTRYCHIUM MULTIFIDUM var. SILAIFOLIUM (Presl) Broun, Ind. N. Am. Ferns, 41. 1938. *B. ternatum* var. *intermedium* D. C. Eaton. Leathery Grape Fern. Low woods, St. Francis River and Hempstead County (Palmer).

56. BOTRYCHIUM VIRGINIANUM (L.) Sw. in Schrad. Journ. Bot. **1800**: 111. 1801. Rattlesnake Fern. Rich woods. Northwestern half of the state. Common.

Order III. SALVINIALES

Family 1. SALVINIACEAE. Salvinia family

57. AZOLLA CAROLINIANA Willd. Sp. Pl. **5**: 541. 1810. Mosquito Fern. Floating in ponds, sloughs and ditches. Southern.

Family 2. MARSILEACEAE. Pepperwort family

58. MARSILEA VESTITA, Hook & Grev. Ic. Fil. **2**: pl. 159. 1831. Hairy Pepperwort.

59. PILULARIA AMERICANA A. Br. Monatsb. Kön. Akad. Wiss. Berlin, **1863**: 435. 1864. Pillwort. Water Pepper. Collected in 1819 near Fort Smith. Not reported since.

Class: EQUISETINEAE

Order IV. EQUISETALES

Family 1. EQUISETACEAE. Horsetail family

60. EQUISETUM ARVENSE L. Sp. Pl. 1061. 1753. Field Horsetail. Calcareous seepage. Northwest corner of Washington County.

61. EQUISETUM LAEVIGATUM A. Br. Am. Jour. Sci. **46**: 87. 1844. *Equisetum hyemale* var. *intermedium* A. A. Eaton. Smooth Scouring-rush. Calcareous deposits near spring, Jasper, Newton County. Also reported from Palarm and Conway, Faulkner County.

62. EQUISETUM PREALTUM Raf., Fl. Ludov. 13. 1817. *Equisetum robustum* A. Br. *Equisetum hyemale* var. *robustum* (A. Br.) A. A. Eaton. Tall Scouring rush. Banks of streams. Not common.

Class: LYCOPODINEAE

Order V. LYCOPODIALES

Family 1. LYCOPODIACEAE. Clubmoss family

63. LYCOPODIUM ADPRESSUM (Chapm.) Lloyd & Underw. Bull. Torr. Club, **27**: 153. 1900. *Lycopodium inundatum* var. *adpressum* Chapm. Southern Clubmoss. Low, wet, sandy soil. South of Benton, Saline County. Rare.

64. SELAGINELLA APODA (L.) Spring ex Mart. Fl. Bras. **1**: 119. 1840. (as "apus"). Creeping Selaginella. Springy places, wet, open meadows and wet non-calcareous cliffs. Northwest half of the state.

65. SELAGINELLA RUPESTRIS (L.) Spring, Flora, **21**: 149, 182. 1838. Rock Spikemoss. Dry or moist non-calcareous cliffs. North.

Class: ISOETINEAE

Order VI. ISOETALES

Family 1. ISOETACEAE. Quillwort family

66. ISOETES BUTLERI Engelm. Bot. Gaz. **3**: 1. 1878. Butler's Quillwort. Temporary pools, often calcareous. Not common.

67. ISOETES MELANOPODA Gay & Durieu, Bull. Soc. Bot. France, **11**: 102. 1864. Quillwort. Shallow ponds and ditches. Northwest.

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The Ferns and Fern Allies of South Carolina

VELMA D. MATTHEWS

(*Continued from page 80*)

Family 4. POLYPODIACEAE — Fern Family.

1. ADIANTUM L.

1. ADIANTUM CAPILLUS-VENERIS L. — Venus'-Hair Fern.

On inside walls of an old well. Only one collection of this species has been made by the writer and no others seen, although it is listed in the manuals from the state. More intensive search will probably lead to the discovery of additional locations. Counties. DARLINGTON: about 3 miles north of Darlington, *Matthews* and *Rogers* (CC).

2. ADIANTUM PEDATUM L. — Maidenhair Fern.

Damp shady woods. This species is no doubt present in many counties, but there are few collections. Counties. GREENVILLE: Jones Gap, *Leeds* (A); Rainbow Falls, *Wherry* (A). OCONEE: Mountain Rest, *Correll* and *Blomquist* (D); near Walhalla, *Coker*, *Matthews*,

and *Holland* (CC); Tomassee Knob, *Clausen* and *Trapido* (CC, B). PICKENS: Round Top Mountain, *Correll* (D); Six Mile Creek, *H. D. House* (US, NY); Table Rock, *N. R. House* (CC). RICHLAND: Ridgewood (CC).

2. ANCHISTEA Presl.

1. ANCHISTEA VIRGINICA (L.) Presl.

Virginia Chain-Fern.

Low marshes and swamps. This is a common fern in many places in the coastal plain and piedmont. Counties: Aiken, Allendale, Beaufort, Berkeley, Charleston, Chesterfield, Clarendon, Colleton, Darlington, Dillon, Florence, Georgetown, Hampton, Horry, Jasper, Kershaw, Lee, Marion, Marlboro, Richland, Sumter, and Williamsburg.

3. ASPLENIUM L.

1. ASPLENIUM BRADLEYI D. C. Eaton.

Bradley's Spleenwort.

Usually on granite or sandstone rocks. The leaves of many of the Chesterfield County plants are only a few inches long, probably due to the very dry habitat. The majority of the plants are on a large boulder of iron ore at the foot of the mountain, but there are a few plants on some of the small rocks nearby. Sugar Loaf Mt. is a ferruginous sandstone hill with considerable rock in places, standing about 150 feet above the surrounding sand hills. No plants of this fern were found on the rocks on the elevation. Dr. Wherry[1] reports that the plants on Henry Knob were growing at an elevation of 1,000 to 1,200 feet. Counties. CHESTERFIELD: Sugar Loaf Mt., *Matthews* (CC, A). YORK: Henry Knob, *Wherry* (A).

[1] This JOURNAL 24: 99, 1934.

2. ASPLENIUM HETEROCHROUM Kunze.

Varicolored Spleenwort.

The only collection of this species from South Carolina is the following: BERKELEY: Santee Canal, *Ravenel* (NY). The specimen from the Santee Canal in the Gray Herbarium is considered by Weatherby, however, as a dentate form of *A. resiliens*.

3. ASPLENIUM MONTANUM Willd.

Mountain Spleenwort.

On rocks in the upper part of the state. Counties. GREENVILLE: Hogback Mt., *Kimber* and *Wright* (A); near Hogback Mt., *Wherry* (A); above Raven Cliff Falls, *Wherry* (A); Caesar's Head—(Ch.), and *Leeds* (A). PICKENS: Round Top Mt., *Correll* (D); Sassafras Mt., *Clausen* and *Trapido* (B, CC); Table Rock, *Radford* (F).

4. ASPLENIUM PINNATIFIDUM Nutt. Lobed Spleenwort.

On rocks in the upper part of the state. Counties. GREENVILLE: Hogback Mt., *Kimber* and *Wright* (A); near Hogback Mt., *Wherry* (A); Caesar's Head, *Leeds* (A). PICKENS: Table Rock, *Buckley* (G), and *Radford* (D, F).

5. ASPLENIUM PLATYNEURON (L.) Oakes.

Ebony Spleenwort.

One of the common ferns throughout the state. Serrate forms are present in a number of places. Counties: Aiken, Anderson, Beaufort, Berkeley, Charleston, Cherokee, Chester, Chesterfield, Clarendon, Darlington, Dillon, Dorchester, Edgefield, Florence, Georgetown, Greenville, Horry, Kershaw, Lancaster, Lee, Lexington, Marlboro, McCormick, Oconee, Orangeburg, Pickens, Richland, Sumter, Spartanburg, and York.

6. ASPLENIUM RESILIENS Kuntze.

Black-stemmed Spleenwort.

On rocks or on masonry, preferring limestone. Counties. BERKELEY: along Santee Canal 2 miles northeast of Moncks Corner, *Wherry* (A); on locks of Santee Canal near Black Oak Church, *Matthews* and *Rowland* (CC). OCONEE: Tomassee Knob, *H. D. House* (NY). ORANGEBURG: Eutaw Springs, *Ravenel* (G), *Bragg* (Ch.), *Matthews* and *Hewitt* (CC).

7. ASPLENIUM TRICHOMANES L. Maidenhair Spleenwort.

On rocks, in cool sheltered situations. Counties. GREENVILLE: Falls of the Saluda River, *Smith* (G); Gorge of Matthews Creek at base of Raven Cliff and below Rainbow Falls, *Wherry* (A); Blythe Shoals, *Thomason* (F). OCONEE: Tomassee Knob, *H. D. House* (NY). PICKENS: Round Top Mt., *Correll* (D).

4. ATHYRIUM Roth.

1. ATHYRIUM ASPLENIOIDES (Michx.) Desv. Lady Fern.

Moist woods, often in the shade. This is a common species throughout the state. Counties: Aiken, Anderson, Bamberg, Beaufort, Berkeley, Charleston, Cherokee, Chester, Chesterfield, Darlington, Dillon, Dorchester, Edgefield, Florence, Georgetown, Greenville, Hampton, Horry, Lancaster, Lee, Lexington, Marion, Marlboro, McCormick, Oconee, Pickens, Richland, Spartanburg, and Sumter.

5. CAMPTOSORUS Link.

1. CAMPTOSORUS RHIZOPHYLLUS (L.) Link.

Walking Fern.

On rocky shaded banks, preferring limestone. Counties. GREENVILLE: Rainbow Falls, 4 miles east of Jones Gap, *Wherry* (A); Gorge of Matthews Creek at base of Raven Cliff, *Wherry* (A); shaded ravine near source of North Saluda River, *Ives* (F). OCONEE:—ravine below

Isaquena Falls, southeast of Stump House Mt., *Clausen* and *Trapido* (B, CC).

6. CHEILANTHES Sw.

1. CHEILANTHES LANOSA (Michx.) Watt.
Hairy Lip-Fern.

Dry rocks and ledges, often associated with *Woodsia obtusa*. Counties. ANDERSON: Anderson, *Davis* (NC, A, G); Simpson's Mill, *Davis* (US). CHESTER: Torbits, *Green* (A). GREENVILLE: bridge 2 miles east of Lima, *Wherry* (A, US); granite ledges north of Lima, *Wherry* (A); Rocky Spur Mt., *Peattie* (G); Paris Mt., *Radford* (F, CC), *Clausen* and *Trapido* (B, CC), and *Mackenzie* (NY). LANCASTER: Forty-acre Rock, *Matthews* and *Boland* (CC). OCONEE: Tomassee Knob, *H. D. House* (US, NY) and *Clausen* and *Trapido* (B, CC).

2. CHEILANTHES TOMENTOSA Link. Woolly Lip-Fern.

On rocks and in rocky soil. Counties. CHARLESTON: Mt. Pleasant,—(Ch.). CHESTER: Torbits, *Green* (G). GREENVILLE: Caesar's Head—(Ch.); Paris Mt., *Wherry* (A), *Powell* (F), and *Clausen* and *Trapido* (B, CC). OCONEE: Tomassee Knob, *Clausen* and *Trapido* (B, CC); 3 miles north of Salem, *Blomquist* (D, CC). PICKENS: Pinnacle Mt., *Radford* (CC).

7. CYSTOPTERIS Bernh.

1. CYSTOPTERIS FRAGILIS (L.) Bernh.
Fragile Bladder-Fern.

Moist banks in the western counties. Wherry labels his collections cited below as *C. fragilis* var. *mackayii*. Counties. GREENVILLE: moist rocks in creek gorge 5 miles northeast of Merrittsville, *Wherry* (A). PICKENS: gorge of Eastatoe Creek, near Rocky Bottom, *Wherry* (A). There is a note by Weatherby on the following specimen that it is probably *C. fragilis* var. *protrusa*: OCONEE: Tomassee Knob, *H. D. House* (NY).

8. DENNSTAEDTIA Bernh.

1. DENNSTAEDTIA PUNCTILOBULA (Michx.) Moore.
Hay-scented Fern.

Open hillsides and woods in the western part of the state. Counties. GREENVILLE: Caesar's Head, *Leeds* (A); Paris Mt., *Fullbright* (F). OCONEE: Mountain Rest, *Correll* (D); Oconee State Park, *Matthews* and *Holland* (CC). PICKENS: Round Top Mt., *Correll* (D); Sassafras Mt., *Clausen* and *Trapido* (B, CC); Rocky Bottom, *Matthews* and *Holland* (CC).

9. DIPLAZIUM Sw.

1. DIPLAZIUM ACROSTICHOIDES (Sw.) Butters.
Silvery Spleenwort.

Damp shaded woods. Counties. GREENVILLE: Rainbow Falls, *Wherry* (A). OCONEE: Tomassee Knob, *H. D. House* (US); woods southeast of Tomassee Knob. *Clausen* and *Trapido* (CC, B). PICKENS: gorge of Eastatoe Creek, near Rocky Bottom, *Wherry* (A); Round Top Mt., *Correll* (D).

10. DRYOPTERIS Adans.

1. DRYOPTERIS ATROPALUSTRIS Small; regarded by Wherry as *D. cristata* × *goldiana*.

So far as we know there is only one collection of this rare fern from the state. Counties. BERKELEY: Santee Canal, *Ravenel* (G). There is a good photograph of the specimen in the Herbarium of the New York Botanical Garden.

2. DRYOPTERIS CLINTONIANA (D. C. Eaton) Dowell.
Clinton's Shield-Fern.

Damp woods and swamps. At our station this fern is growing in the same region with *Dryopteris spinulosa*. A similar association was found by F. W. Gray near Char-

lotte, North Carolina. The Darlington county plants were first found by B. E. Smith. Counties. DARLINGTON: Swamp along Swift Creek 8 miles southeast of Hartsville, *Smith* and *Matthews* (CC).[1]

3. DRYOPTERIS INTERMEDIA (Muhl.) A. Gray.
American Shield-Fern.

Moist woods. Counties. GREENVILLE: creek gorge 5 miles northeast of Merrittsville, *Wherry* (A). PICKENS: gorge of Eastatoe Creek, near Rocky Bottom, *Wherry* (A).

4. DRYOPTERIS GOLDIANA (Hook.) A. Gray.
Goldie's Shield-Fern.

Moist rich woods. There seems to be only one collection of this species from our state. Counties: OCONEE: Tomassee Knob, *H. D. House* (US).

5. DRYOPTERIS LUDOVICIANA (Kunze) Small. (*D. floridana* (Hook.) O. Ktze.) Southern Shield-Fern.

Damp woods and swamps in the coastal plain. This is a beautiful evergreen fern, which is hardy at Hartsville. Counties. BEAUFORT: Dale, *Gibson* (CC). CHARLESTON: navy yard at Charleston, *Bragg* (Ch.) and *Trudell* (A). GEORGETOWN: near Brookgreen, *Matthews* and *Hewitt* (CC) and *Tarbox* (NY); Pawleys Island, *Matthews* (CC). ORANGEBURG: Four Hole Creek Swamp, south of Orangeburg, *Coker* (CC)

6. DRYOPTERIS MARGINALIS (L.) A. Gray.
Marginal Shield-Fern.

Moist woods and rocky slopes. Counties. GREENVILLE: Hogback Mt., *Hewitt* and *Smith* (CC); Blythe Shoals, *Thomason* (F). OCONEE: Tomassee Knob, *H. D. House*

[1] Dr. Edgar T. Wherry writes that he considers a specimen collected by Ravenel along the Santee Canal, which is now in the Brown University Herbarium, *Dryopteris celsa* and that this specimen is similar to the Hartsville collection.

(US). PICKENS: Round Top Mt., *Correll* (D); Sassafras Mt., *Clausen* and *Trapido* (B, CC); Table Rock, *Radford* (F).

7. DRYOPTERIS SPINULOSA (Muell.) Watt.

Spinulose Shield-Fern.

Moist shady woods. The Darlington county plants are growing on old fallen trunks of trees and a few in the depressions in the bases of living cypress trees. The location reported below is the first station known from South Carolina and considerably extends the known range for this fern southward. This station was first found by B. E. Smith. Counties: DARLINGTON: Cypress swamp along Swift Creek, 8 miles southeast of Hartsville, *Smith* and *Matthews* (CC).

11. LORINSERIA Presl.

1. LORINSERIA AREOLATA (L.) Presl.

Narrow-leaved Chain-Fern.

Moist woods and swamps, preferring acid soils. Counties: Aiken, Allendale, Anderson, Bamberg, Beaufort, Berkeley, Charleston, Chesterfield, Clarendon, Colleton, Darlington, Dillon, Edgefield, Florence, Georgetown, Greenville, Hampton, Horry, Jasper, Kershaw, Lancaster, Lee, Lexington, Marion, Marlboro, Oconee, Pickens, and Sumter.

12. ONOCLEA L.

1. ONOCLEA SENSIBILIS L. Sensitive Fern.

Moist woods and swamps. The variation which has been given the name *O. sensibilis* forma *obtusilobata* is found in many colonies of this species. Counties. ALLENDALE: near Sycamore, *Matthews* (CC). BEAUFORT: Dale, *Gibson* (CC). BERKELEY: Santee Canal, *Ravenel* (Ch.); near Pineville, *Matthews* and *Hewitt*

(CC). DARLINGTON: Hartsville, *Matthews* (CC). FLORENCE: near T. B. Sanitarium, *Matthews* and *Bain* (CC). GEORGETOWN: swamp along Winyah Bay, *Matthews* and *Hewitt* (CC); near Brookgreen, *Matthews* (CC); Pawleys Island, *Matthews* (CC). GREENVILLE: along South Saluda River, *King* (CC); near Greenville, *Reaves* (CC); Caesar's Head—(Ch.). HORRY: south of Myrtle Beach, *Matthews* (CC). JASPER: east side of Savannah River, *Leeds* (A); swamp along Savannah River, *Gibson* (CC). LEE: Lee State Park, *Matthews* (CC). RICHLAND: Adams Pond, *Philson* (CC).

13. PELLAEA Link.

1. PELLAEA ATROPURPUREA (L.) Link. Cliff Brake.

On rocks, chiefly limestone, but in the Carolinas also gneiss. I am indebted to Mr. Wm. A. Knight for giving me directions to locate this fern in South Carolina. Counties: OCONEE: on a large rock on a low ridge on the opposite side from the road, 4.7 miles from the statue in the town of Walhalla on highway #28 going towards Highlands, *Matthews, Coker* and *Holland* (CC).

14. PHEGOPTERIS Fée.

1. PHEGOPTERIS HEXAGONOPTERA (Michx.) Fée.
Broad Beech-Fern.

Moist shaded woods. Counties. BERKELEY: St. Johns, *Porcher* (Ch.); along Santee Canal northeast of Moncks Corner, *Wherry* (A). DARLINGTON: Lauthers Lake, *Smith* (CC). DORCHESTER: Middleton Gardens, *Matthews* and *Hewitt* (CC), *Correll* (D). GREENVILLE: Jones Gap, *Leeds* (A); 5 miles northeast of Merrittsville, *Wherry* (A); Caesar's Head, *Bragg* (Ch.), *Philson* (SC, CC); Vaughan's Glenn, *Peattie* (NC, G); Blythe Shoals, *Thomason* (F). OCONEE: Newry, *H. D. House* (US, NY), *Anderson* (US); Tomassee Knob, *Clausen* and *Trapido* (CC, B). PICKENS: Clemson College, *H. D.*

House (US); Table Rock, *N. R. House* (CC); Round Top Mt., *Correll* (D); slopes of Table Mt., *Small* (NY).

15. POLYPODIUM L.

1. POLYPODIUM POLYPODIOIDES (L.) Watt.

Gray Polypody.

Common on trunks of trees, but also on humus and on rocks. This fern is probably found in every county in the state. Counties: Aiken, Anderson, Bamberg, Beaufort, Berkeley, Charleston, Chester, Clarendon, Colleton, Darlington, Dillon, Dorchester, Edgefield, Fairfield, Florence, Georgetown, Greenville, Horry, Jasper, Kershaw, Lancaster, Lee, Lexington, Marlboro, McCormick, Oconee, Orangeburg, Pickens, and Sumter.

2. POLYPODIUM VIRGINIANUM L. Common Polypody.

On rocks, tree trunks, and humus. Counties. GREENVILLE: Caesar's Head, *Bragg* (Ch.); above Raven Cliff Falls, *Wherry* (A); Hogback Mt., *Hewitt* and *Smith* (CC). OCONEE: Tomassee Knob, *H. D. House* (US, NY). PICKENS: Round Top Mt., *Correll* (D); near Pickens, *Pyron* and *McVaugh* (D); gorge of Eastatoe Creek, near Rocky Bottom, *Wherry* (A); Sassafras Mt., *Clausen* and *Trapido* (B, CC).

16. POLYSTICHUM Roth.

1. POLYSTICHUM ACROSTICHOIDES (Michx.) Schott.

Christmas Fern.

Shaded woods, often on slopes, and in swamps. This fern probably occurs in most of the counties in the state. Counties: Anderson, Beaufort, Berkeley, Charleston, Cherokee, Chester, Chesterfield, Darlington, Dorchester, Edgefield, Florence, Georgetown, Greenville, Greenwood, Horry, Kershaw, Lancaster, Lexington, McCormick, Oconee, Pickens, Richland, Spartanburg, and Sumter.

(*To be continued*)

A Summer in Northern Europe

Harold G. Rugg

During the summer of 1939 it was my good fortune to motor over a thousand miles in Ireland, and nearly fifteen hundred miles in England and Wales, and later to go by boat to Finland. Of course while motoring I was always on the alert for new ferns, frequently getting out of the car and exploring hedge-rows, shady woods and rocky cliffs.

I suppose I saw thousands of plants of the maidenhair spleenwort, *Asplenium trichomanes* L., the rue spleenwort, *Asplenium ruta-muraria* L., *Ceterach officinarum* DC. and *Polypodium vulgare* L. The first two were the most plenteous. These four were growing abundantly on the walls lining the roads, and occasionally around walls surrounding barnyards, etc. The English walls of course differ from those on this side of the Atlantic in that they are solid and the ferns appear in great abundance in the cracks and crevices. Occasionally plants of *Asplenium adiantum-nigrum* L. were found in the walls or by the roadside in rocky places. I often wished that I could transfer a bit of old English wall back to my garden and have these ferns in such abundance. In many places one would not suppose that the walls contained sufficient soil to allow germination and growth of spores. The luxuriant growth and abundance of these ferns may be due to the great amount of moisture in the air, and to the lack of abundant sunshine.

I went to Chard in Somerset for two days to attend the annual field meeting of the British Pteridological Society. The members whom I met are apparently not interested in collecting ferns for herbarium specimens but primarily in finding new varieties and forms which they can take to their gardens for cultivation. Appar-

ently there is a much greater interest in raising ferns in England than in the United States. One afternoon was spent around a long table examining ferns which had been sent in by various members of the Society from Ireland and various parts of England. Some of these were sent for identification and others for a certificate of merit offered by the Society for "new varieties or improved forms of existing varieties."

A day and a half was spent going through the various woodsy territories around Chard and along the hedgerows hoping that variants might be found. The members went out of their way to show me interesting stations of ferns which they had previously visited but which they knew would give me a thrill. For instance, I think all the members present had seen the finest station in England of hart's-tongue, *Phyllitis scolopendrium* (L.) Newm. One afternoon I was taken to this station at Landslip near Lyme Regis, near the sea coast. There were hundreds of plants growing in dense shade in a moist, rocky ravine—plants bearing from ten to twenty fronds and the fronds from a foot to a foot and a half in length. A form approaching *undulatum* was found. It certainly was a thrilling sight for one who has never seen this plant growing wild in the United States. *Dryopteris* (called Lastrea by our English cousins) *filix-mas* (L.) Schott was abundant, as well as various forms of *Athyrium filix-femina* (L.) Roth. *Polystichum angulare* Presl, somewhat resembling our *Polystichum braunii* (Spenner) Fée, was abundant in places.

The President of the Society, Mr. W. B. Cranfield, a grand old man of eighty, invited me to see his collection of ferns, undoubtedly the largest private collection in England, but the approach of war prevented my getting out to his home. I was especially anxious to see a cross of *Polystichum angulare* Presl and *Polystichum acrostichoides* (Michaux) Schott which he had produced.

I did visit the very large nursery of Mr. Amos Perry, another member of the Society. He undoubtedly raises more ferns for sale than anyone else in England. I was interested in seeing there an *Adiantum* from Japan, the fronds of which are pink when first appearing. Some of the fronds retain their pinkish color throughout the entire season. Through Mr. Perry's generosity I was able to secure spores of this fern.

I also attended a show conducted by the Alpine Garden Society where were exhibited many hardy ferns, all of which, however, had been raised in pans in alpine houses rather than outside in the ground. Here were beautiful specimens of *Asplenium viride* Huds. The owners told me that they had no difficulty at all with this rare fern. One exhibitor had an unlabeled fern resembling *Asplenium trichomanes* L. The pinnae were no larger than that of *trichomanes* but the fronds were from eight to twelve inches long. I found that in most English gardens there were alpine houses in which the choice and rarer alpines and ferns are grown in pans and pots rather than out of doors.

I was disappointed in the fern flora of Finland. The only ferns I saw there were identical with or closely related to our own North American ferns and these were not seen in any abundance. At Valamo on Lake Ladoga near what was then the Russian border there was *Dryopteris filix-mas* (L.) Schott. *Pteridium aquilinum* (L.) Kuhn was also occasionally seen. North of the Arctic Circle on the Arctic Ocean were found *Athyrium filix-femina* (L.) Roth, *Dryopteris linnaeana* Christensen, *D. phegopteris* (L.) Christensen and *D. dilatata* (Hoffm.) Gray. None of these, however, were seen in any great abundance, and no strictly rock ferns were seen at all.

Hanover, New Hampshire

Recent Fern Literature

HARDY FERNS AND THEIR CULTURE. (Edited by Carol Woodward.)

It is a pleasure to bring this fern publication of the New York Botanical Garden to the attention of Fern Journal readers. Its forty pages consist of a series of articles which appeared in the Journal of the N. Y. Botanical Garden during March, April, and May of 1940, and represent the work of twelve authors and photographers.

Although ferns have always received considerable attention throughout the forty-odd years of the existence of the New York Garden, the publication of this pamphlet may be said to signalize a sort of climax of interest in hardy ferns for the Bronx Garden. As noted in its pages, the New York Garden made a special display of hardy ferns at the 1940 International Flower Show at the Grand Central Palace last March when approximately 140 varieties, native and introduced, were forced and shown in naturalistic arrangement. In this connection, the Fern Society may take pride in the fact that two of its members, the Thurstons, had shown the way in forcing and exhibiting hardy ferns by their splendid display at the International Show of two years earlier, reported in the FERN JOURNAL. Also, their carefully prepared article describing the forcing requirements of various species was made available to the New York Botanical Garden in advance of its publication in the JOURNAL.

It may be a matter of interest to record here a little of the long-standing activity in fern study which has characterized the N. Y. Botanical Garden since its founding. Willard N. Clute was an early worker there. Prof. L. M. Underwood, a noted fern student, then professor of botany at Columbia University, was instrumental in the development of the fern herbarium, which is one of the largest in the world. Since his death, it has been desig-

nated as the "Underwood Fern Herbarium." A fern part of the North American Flora, covering certain fern families begun by Dr. Underwood, was completed by Dr. Maxon and R. C. Benedict. Dr. Winifred Robinson worked up a fern flora of the Hawaiian Islands at the Garden. Miss Margaret Slosson and Dr. A. C. Smith gave ferns special attention for a number of years. For many years the greenhouses of the Garden housed the largest collection of living tropical fern species on the American continents. Within the past few years, Dr. John K. Small, in a burst of interest, has published a series of articles and books on the ferns of the eastern and southern states.

From the standpoint of the Fern Society in particular, it may be noted that our membership list, has been honored by the names of not a few staff members of the N. Y. Botanical Garden, Dr. and Mrs. Britton, Drs. Barnhart, Howe, and others. Indeed the support of these staff members was of particular value at the time of the founding of the AMERICAN FERN JOURNAL in 1910.

That this present publication will be of interest to Fern Society members will be indicated by the list of the articles below. It is well illustrated by numerous halftones by L. W. Brownell, Rutherford Platt, and others. Its price is twenty-five cents and it may be obtained through Miss Carol Woodward, N. Y. Botanical Garden, Bronx Park, New York City.

The life story of a fern. H. W. Rickett.
Notes on the cultivation of hardy ferns. Isaac Langley Williams.
Hardy ferns of exotic and horticultural origin. Stuart Longmuir.
Crested hart's-tongue fern. T. A. Weston.
Ferns exhibited at International Flower Show.
Forcing ferns for display. Joseph W. Tansey.
Ferns of antiquity. Harold N. Moldenke.
Fern literature for the student and gardener. Elizabeth C. Hall.
Raising ferns from spores. T. H. Everett.
Fern diseases and pests. B. O. Dodge.

"Western ferns for eastern growers," "Hardy ferns for the shaded garden," and "Ferns for the woodland garden" are photographically presented by means of series of fine half-tones of the species, from photographs by Miss Fleda Griffith.—R. C. BENEDICT.

Prof. Blomquist and Dr. Correll have published an excellent fern flora (modestly called a county check-list) of North Carolina. The three principal divisions of the state, so far as the distribution of plants is concerned, mountain, piedmont and coastal plain, are clearly defined and mapped, and the county records are grouped under these regions, thus making it easy to arrive at an outline of distribution. This, the exact detail with which habitats are recorded, the taxonomic discussions under *Dryopteris celsa* and *Botrychium obliquum*, and the obvious care and thoroughness in preparation throughout, are distinctive features of a very good piece of work.[1]

The Gardeners' Chronicle of London recommends the cutting of bracken for bedding of domestic animals in these times when "oat and barley straw are too valuable" to be so employed and can more usefully be fed to stock. Manure from bracken litter may, it says, be expected to be as good as that from straw, though the tough stipes of the bracken disintegrate more slowly in the soil. In England, bracken may be cut throughout the winter; and it is "also useful in the garden for protecting frames and rare plants."[2]

There has been a good deal of difference of opinion as to the proper application of the name *Polystichum acu-*

[1] Blomquist, H. L., & D. S. Correll. County Check List of North Carolina Ferns and Fern Allies. Journ. Elisha Mitchell Soc. 56: 63–105, 1 map (1940).

[2] Gardeners' Chronicle, 3rd series, **108**: 23 (July 20, 1940).

leatum, once applied to some of our west-American species, but of late restricted to Old-World plants. Even so, there has been question as to which of the two species otherwise known as *P. lobatum* and *P. angulare* was really what Linnaeus meant. Some taxonomists maintained the question never could be decided and rejected the Linnaean name altogether.

Recently, however, Mr. Alston has studied the type specimens concerned. He concludes that the name *P. aculeatum* belongs definitely to the species hitherto called *P. lobatum. P. angulare* takes the earlier name *P. setiferum* (Forsk.) Woynar.[3]

Hot Springs, Arkansas, has a Natural History Association of which a member of the Fern Society, Dr. F. J. Scully, is president. The Association publishes quarterly a mimeographed Natural History Journal. No. 5 of this journal (1939) consists of an account, by Dr. Scully, of the 26 species of ferns found in and near the Hot Springs National Park.

It is an unassuming and non-technical, but genuinely good local study. It is prefaced by some general information in regard to ferns and to the topography of the region. For each species a statement of habitat and frequency, an informal description, which makes no attempt to go into technical detail, but is exact as far as it goes, and an outline sketch, rather rough, but suggesting the distinctive architecture of the frond, are given. Some small errors have crept in; "rootstock," not "rootstalk" is the proper term for the underground parts of a fern; and there are nearer 9000 than 4000 known species of ferns. But the little work as a whole gives good evidence of that type of accurate and intelligent observa-

[3] Alston, A. H. G. The correct application of the name Polystichum aculeatum. Journ. Bot. 78: 160–164 (1940).

tion which the active amateur can make, to the aid of others of like interests and often to the real advantage of science.

Shorter Notes

RECENT RANGE EXTENSIONS OF TWO FERNS IN WEST VIRGINIA.—During the summer of 1940 two ferns, *Lygodium palmatum* (Bernh.) Sw. and *Asplenium ebenoides* R. R. Scott (*Asplenosorus ebenoides* Wherry), both regarded as rare in West Virginia, were found in counties of the State from which they had not previously been recorded.

The Climbing Fern has been known from only two localities in West Virginia, both stations being in Upshur County. (A station for the species in Greenbrier County has been destroyed by road construction.) In July, 1940, Mrs. Martha Cunningham, of Webster Springs, discovered a considerable station for the species in Webster County, adjoining Upshur County. Both Webster and Upshur Counties are mountainous, lying just west of the higher Allegheny ridges. It may be surmised, from these recent discoveries, that the Climbing Fern will be found eventually in isolated localities in all the mountainous counties of the Allegheny Plateau.

Scott's Spleenwort has been known from localities in four counties, Jefferson, Pendleton, Greenbrier, and Fayette, all in the eastern or central portions of the State. Due to the efforts of Miss Maxine Thacker, a teacher in the high school of West Hamlin, Lincoln County, this interesting hybrid has been found in this latter locality. Lincoln County is in southwestern West Virginia, and is, botanically speaking, comparatively unknown. The find represents a considerable extension of the known range in West Virginia for this plant.

Specimens of both ferns have been deposited in the herbarium of West Virginia University, at Morgantown. —MAURICE BROOKS, *Division of Forestry, West Virginia University, Morgantown, W. Va.*

ADDITIONS TO THE FERN FLORA OF LAKE SHEHAWKEN, PENNSYLVANIA.—In the January–March Number of the FERN JOURNAL in 1939 I reported fifty-two species of ferns and fern allies found in the vicinity of Lake Shehawken, Pa. Since that time the following additional species have been found.

DRYOPTERIS CAMPYLOPTERA (Kze.) Clarkson.—On Mount Ararat at an elevation of 2600 feet. This mountain is a northern extension of the Moosic Range which runs for several miles along the western boundary of Wayne County and culminates at Sugarloaf Mountain, about a mile north of Ararat. *D. campyloptera* is reported to have been collected on Sugarloaf, but it has apparently disappeared there. On the summit of Ararat it grows abundantly, covering an area of several acres. A peculiarity of this fern here is that a large number of the fronds exhibit a characteristic of *D. intermedia* in having the penultimate pinnule of the lower side of the basal pinnae longer than the ultimate pinnule. The indusia of all these ferns in this locality are non-glandular, even on many specimens that have otherwise the appearance of *D. intermedia*. That they have hybridized with *D. intermedia* seems to be precluded by the non-glandular indusia. Dr. Wherry mentions the possibility of hybridization with *D. intermedia*, saying, "There are several variants or hybrids centering around *D. intermedia* which will have to be described for the Pennsylvania Flora." Mr. Weatherby admits the possibility of hybridization, and mentions among other factors which may account for this peculiarity, "Some species misbehave at the limits of their range."

DRYOPTERIS CLINTONIANA (D. C. Eaton) Dowell.—In Bennett's swamp just west of the lake, and in a swamp in King's woods a mile and a half north west of the lake. Probably to be found in many other swamps.

LYCOPODIUM INUNDATUM L.—Less than a dozen plants found near the outlet of the lake.

ISOETES ENGELMANNI A. Br.—Rather common on the shores of the west branch of Delaware River just above Hancock, N. Y., and below Winterdale, Pa.

ISOETES RIPARIA Engelm.—A single specimen was collected by Dr. Clausen at Island Lake, and another by Dr. Wherry at Bone Pond, at the trip of the Fern Society in September, 1939. Attempts to find more at both localities have been unsuccessful.—W. L. DIX, *Morrisville, Pennsylvania.*

American Fern Society

On June 27, 1940, as reported in Science, Professor Fermen L. Pickett, a member of the Fern Society since 1914, died at the age of fifty-nine years. Professor Pickett had been Dean of the Graduate School at the Washington State College since 1930, and Chairman of the Department of Botany there since 1917.

For many years, Professor Pickett's chief research work had had to do with ferns, particularly with careful experimental studies of the special adaptive characteristics by which those species which live in dry situations are distinguished from the forms of moister habitats. Some of Dr. Pickett's fern papers have been published in the FERN JOURNAL; the first in 1914, the most recent in 1931. His longer reports appeared in the Bulletin of the Torrey Botanical Club, in the American Journal of Botany, and in the Botanical Gazette.

Working with three species of *Pellaea*, with *Camptosorus*, *Polypodium vulgare*, *Cheilanthes gracillima*, and

others, Professor Pickett had investigated the capacity of all stages of these dry-ground ferns to resist desiccation. He found that resistance to drying was manifested as well by the delicate prothallia as by the more obviously protected leafy generation. Indeed, the prothallia of these xerophytic species showed an ability to recover even after they had been dried over sulphuric acid fumes to practically complete absence of water. On the other hand, the prothallia of ordinary moist ground ferns were killed after only partial drying.

New members:

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Smith, Dr. A. C., Arnold Arboretum, Jamaica Plain, Mass.

Index to Volume 30

ABBEY, F. M. Our native ferns and their cultivation (review), 102
Acrostichum conforme, 14; reticulatum, 14; squamosum, 14
Adder's-tongue, 5, 31, 76–78, 115; Engelmann's, 5; limestone, 115
Adiantum Capillus-Veneris, 11, 27, 56, 108, 114, 119; pedatum, 8, 94, 114, 119; tricholepis, 57, 58
Adventures in fern collecting, III, 1
Ae, 15
Akole, 14
ALSTON, A. H. G. Correct application of the name Polystichum aculeatum (review), 134
Amau, 16
Amaumau, 15
American Fern Society, 32, 66, 104, 139; meeting at Columbus, 37, at Jacksonville, 70, at Lake Shehawken, 66
Anacharis densa, 103
Anchistea virginica, 94, 114, 120. See also Woodwardia
Anemia adiantifolia, 71
Annotated list of ferns of the Kilauea-Mauna Loa section of Hawaii National Park, 9
Arkansas, Pteridophyta, 105; Selaginella rupestris in, 50
Aspidium caryotideum, 13; cristatum, 111; Filix-mas var. parallelogrammum, 13; glabrum, 13; globuliferum, 13; hawaiiense, 13; marginale, 111; noveboracense, 111; spinulosum, 111; Thelypteris, 111; truncatum, 13. See also Cyrtomium and Dryopteris
Asplenium abscissum, 71; Adiantum-nigrum, 12, 129; angustifolium, 112; asplenioides, 12, 112; Bradleyi, 112, 120; contiguum, 12, var. laciniatum, 17; cryptolepis, 112; Curtissii, 71; ebeneum var. incisum, 93; ebenoides, 62, 94, 113, 136; erectum var. Macraei, 12; furcatum, 12; heterochroum, 71, 121; lobulatum, 12; Macraei 12; montanum, 121; multisectum, 12; nitidulum, 12; parvulum, 113; pinnatifidum, 62, 98, 113, 121; platyneuron, 8, 23, 70, 71, 93, 107, 113, 121, f. Hortonae, 93, f. **incisum,** 93, f. serratum, 8, 93, 113, var. incisum, 113; pseudofalcatum, 12; pumilum, 71; pycnocarpon, 112; resectum, 12; resiliens, 8, 113, 122; rhipidoneuron, 12; Ruta-muraria, 112, 129, var. cryptolepis, 93, 95; sandwichianum, 13; sphenolobum var. diplaziosorum, 12; thelypteroides, β serratum, 92; Trichomanes, 12, 93, 113, 122, 129, 131; unilaterale, 12; verecundum, 71; viride, 131. See also Athyrium and Diplazium
× Asplenosorus ebenoides, 94, 107, 113, 136
Athyrium acrostichoides, 31; angustum, 107, 112, var. elatius, 92, var. rubellum, 7, 8, 31, 92, var. typicum, 98; asplenioides, 31, 63, 92, 106, 107, 112, 122, f. subtripinnatum, 92, 106, 112; Filix-femina, 130, 131, var. asplenioides, 112; Poiretianum, 12; pycnocarpum, 98; thelypteroides, 31, 92, 107, f. acrostichoides, 93, f. serratum, 92. See also Asplenium and Diplazium
Aulacomnium heterostichum, 27
Azolla, 101; caroliniana, 103, 116; filiculoides, 103, on Long Island, 103

Bartramia pomiformis, 27
BLOMQUIST, H. L. County checklist of North Carolina ferns and fern allies (review), 134; report of the judge of elections for 1939, 36
Botrychium alabamense, 76; angustisegmentum, 31; biternatum, 76; dissectum, 44, 45, 63, 64, 76, 115, distinguishing from B. obliquum, 63, f. oneidense, 45, var. obliquum, 4, 7, 116, var. tenuifolium, 115; lanceolatum, 31, var. angustisegmentum, 44; matricariaefolium, 43, 137, in Maryland, 137, f. gracile, 43, f. palmatum, 43; multifidum, 45, 69, var. intermedium, 45, var. oneidense, 45, subsp. silaifolium, 45, 69, var. silaifolium, 116; obliquum, 44, 45, 63, 64, 76, 116, 134, distinguishing from B. dissectum, 63, f. elongatum, 44, f. oblongifolium, 44, f. **pennsylvanicum,** 44, var. dissectum, 115, var. oblongifolium, 44, var. pennsylvanicum, 44, var. tenuifolium, 44, 76, 115; simplex, subcompositum, 43, var. compositum, 43, var. laxifolium, 43, var. tenebrosum, 43, 98, ternatum var. intermedium, 116; virginianum, 7, 45, 77, 116, var. gracile, 46
Bracken, 15, 134, eastern, 114
Brake, cliff, 14, 31, 127; crested, cliff, 113; Cretan, 15; long-leaved, 15; purple cliff, 113; smooth cliff, 113
BROOKS, M. G. Pteridophytes of West Virginia (review), 30; recent range extensions of two ferns in West Virginia, 136

California, Cyrtomium in southern, 52

Camptosorus rhizophyllus, 8, 94, 107, 112, 113, 122, f. Boycei, 94
Ceropteris ochracea, 12
Ceterach officinarum, 129
Cheilanthes, 6; alabamensis, 64, 114; castanea, 102; Feei, 4, 8, 108, 114; Fendleri, 102; lanosa, 4, 8, 95, 114, 123; leucopoda, 58 61; microphylla, 70; tomentosa, 114, 123; Wootoni, 102
Cibotium Chamissoi, 11; glaucum, 11; Menziesii, 11
Cladonia, 5
CLAUSEN, R. T. Azolla filiculoides on Long Island, 103; report of the president for 1939, 32; two ferns new to Kentucky, 27
Club-moss, southern, 117
COFFIN, R. L. Natural hybrid between Polystichum acrostichoides and P. Braunii, 81
Coniogramme pilosa, 13
CORRELL, D. S. A correction, 64; county check-list of North Carolina ferns and fern allies (review), 134; trip to a station for Hymenophyllum in South Carolina, 21
Cyrtomium, 52, 56, in southern California, 52; caryotideum, 13, caryotideum micropteris, 54; falcatum, 52, 54, 56
Cystopteris bulbifera, 47, 110; fragilis, 7, 106, 110, 123, f. magnasora, 47, f. simulans, 8, var. Mackayii, 47, 123, var. protrusa, 23, 106, 110, 123

Dennstaedtia punctilobula, 47, 106, 112, 124. See also Dicksonia
Dicksonia punctilobula, 112. See also Dennstaedtia
Dicranopteris emarginata, 10
Diplazium acrostichoides, 124; Arnottii, 17; pycnocarpon, 112; sandwichianum, 13. See also Asplenium and Athyrium
DIX, W. L. Additions to the fern flora of Lake Shehawken, Pennsylvania, 137; Fern Society meeting at Lake Shehawken, 66
Doryopteris decora, 13
DOW, E. L. Fern Society meeting at Jacksonville, Fla., 70
Dryopteris atropalustris, 124; augescens, 71; Boottii, 69, 90; campyloptera, 137, 138; celsa, 106, 125, 134; Clintoniana, 90, 106, 124, 138, var. australis, 98, 106, 111, var. genuina, 90; cristata, 69, 90, 102, 111; cristata × Goldiana, 124; cyatheoides, 13; dentata, 27; dilatata, 131; Filix-mas, 89, 90, 130, 131; floridana, 125; glabra, 13; globulifera, 13; Goldiana, 90, 125; hawaiiensis, 13; hexagonoptera, 6, 8, 111; intermedia, 62, 90, 125, 138; Keraudreniana, 17; Linnaeana, 131; ludoviciana, 125; marginalis, 89, 102, 106, 111, 125, f. elegans, 89, f. **Braillae,** 89, f. tripinnatifida, 89; marginalis × spinulosa, 89; normalis, 70, 71; noveboracensis, 111, f. fragrans, 91; paleacea, 13; parasitica, 13; Phegopteris, 131; setigera, 71; simulata, 69, 94; spinulosa, 90, 102, 106, 111, 124, 126, var. fructuosa, 90, var. intermedia, 23; stegnogrammoides, 14; Thelypteris var. pubescens, 111; unidentata, 14. See also Aspidium, Phegopteris, and Thelypteris
Dumortiera hirsuta, 26

Ekaha, 14, Akolea, 15
Elaphoglossum conforme, 14; gorgoneum, 17; hirtum, 14; micradenium, 14; reticulatum, 14
Equisetum arvense, 8, 62, 95, 96, 109, 116, f. decumbens, 96, f. diffusum, 96, f. nemorosum, 8, 96, f. pseudosylvaticum, 96; debile, 62; diffusum, 62; fluviatile, 96, f. limosum, 96, f. Linnaeanum, 96, var. limosum, 96; hyemale var. intermedium, 116, var. robustum, 9, 117; laevigatum, 116; prealtum, 96, 117; ramosissimum, 62; robustum, 117; sylvaticum var. multiramosum, 96
Eurhynchium rusciforme, 26
Europe, a summer in northern, 129

FEATHERLY, H. I. Ferns of Oklahoma (review), 102
Fern, Alabama grape, 76; Alabama lip, 113; American bristle, 79; American climbing, 80; American shield, 125; beech, 4, 6; bladder, 31; Braun's holly, 81, 83, 86–88; brittle, 110; broad beech, 111, 127; bulblet, 110; Christmas, 30, 48, 81, 83, 86, 87, 111, 128; cinnamon, 79, 115; climbing, 31, 136; Clinton's shield, 111, 124; cloak, 4; coarse-lobed grape, 76; crested shield, 111; cut-leaved grape, 76, 115; downy wood, 14; dwarf chain, 114; dwarf filmy, 79; false stag-horn, 10; filmy, 37; fragile bladder, 123; Goldie's, 125; grape, 115; hairy lip, 4, 114, 123; hay-scented, 112, 124; interrupted, 115; Japanese climbing, 80; lady, 7, 106, 122; leathery grape, 116; lip, 5, 31; lowland lady, 112; maidenhair, 11, 119; marginal shield, 6, 111, 125; mosquito, 116; narrow-leaved chain, 126; New York, 94, 111; northern marsh, 111; powdery cloak, 113; rattlesnake, 6, 77, 116; resurrection, 114; royal, 79, 115; sensitive,

4, 5, 110, 126; silver, 12; slender lip, 114; southern grape, 76; southern lady, 112; southern shield, 125; spinulose shield, 111, 126; sword, 14; ternate grape, 4; Tunbridge filmy, 78; upland lady, 112; Venus-hair, 114, 119; Virginia chain, 114, 120; walking, 31, 112, 122; walking-leaf, 4; water, 101; wood, 81; woolly lip, 4, 114, 123
Fern collecting, adventures in, III, 1; literature, recent, 30, 62, 102, 132; Society, 32, 66, 104, 139
Ferns and fern allies in the Kutztown Fleetwood area, Pennsylvania, 41, 89; of South Carolina, 73, 119; of Kilauea Mauna Loa section, Hawaii National Park, 9; notes on Texas, 56; two new to Kentucky, 27
Filix Thelypteris, f. frondosa, 91
Fissidens osmundoides, 26
FOWLER, R. L. Ferns of Kilauea-Mauna Loa section of Hawaii National Park, 9

Gleichenia dichotoma, 10; emarginata, 10, 16; glauca, 17, linearis, 17. See also Dicranopteris
Goniopteris reptans, 71
GRIFFITH, G. B. Fertile Scott's spleenwort, 28
GRUBER, C. L. Distinguishing between Botrychium obliquum and B. dissectum, 63; ferns and fern allies in the Kutztown-Fleetwood area, Pennsylvania, 41, 89
Gymnogramma javanica, 13

HAMBLIN, S. F. Lexington Leaflets (review), 31
Hapuu, 11, Iii, 11
Hart's-tongue, 31; English, 130
Hawaii, Ferns of Kilauea-Mauna Loa section of National Park, 9
Homalia Jamesii, 27
Hookeria acutifolia, 26
Horsetail, field, 116
Hydrangea radiata, 23
Hygroamblystegium irriguum, 26
Hygrohypnum alpestre, 26
Hymenophyllum, station for in South Carolina, 21; lanceolatum, 11; obtusum, 11; recurvum, 11; tunbridgense, 22, 23, 27, 37, 78
Hypnum molluscum, 26
Hypolepis repens, 28, extension of range for, 28

Isoetes, 6, a new Philippine, 18; Braunii, 66, 69; Butleri, 5, 9, 117; Engelmanni, 98, 138; hypsophila, 19; japonica, 20; lithophila, 99; melanopoda, 5, 9, 117; neoguinensis, 18, 19; **philippinensis,** 19, 20; riparia, 69, 138; sinensis, 19
Iwaiwa, 11, 12; O Kane, 12

Jubula pennsylvanica, 26

Kaapeapa, 13
Kentucky, two ferns new to, 27
Kihi, 15
Kikawaeo, 13
Kilau, 13, 15
Kolokolo, 15

LAMOTTE, C. Pilularia in Texas, 99
Lastrea, 130; marginalis β Braillae, 89
Laukahi, 10, 13, 14
Leucobryum glaucum, 26
LEWIS, J. B. Ferns and fern allies of Amelia Co., Va. (review), 63
LI, LIANG-CHING. Chinese species of Equisetum (review), 62
Long Island, Azolla filiculoides on, 103
Lorinseria areolata, 94, 114, 126. See also Woodwardia
Loulu, 13
Lycopodium adpressum, 78, 109, 117; cernuum, 16; clavatum, 97; complanatum, 62, var. flabelliforme, 62, 97; flabelliforme, 62; inundatum, 138, var. adpressum, 117; lucidulum, 97; obscurum, 62, var. dendroideum, 97, var. genuinum, 97; phyllanthum, 16; polytrichoides, 16; serratum, 17; tristachyum, 97; venustulum, 16
Lygodium japonicum, 80; palmatum, 62, 80, 136

Maidenhair, 114
Marattia Douglasii, 17
Marginaria polypodioides, 70
Marsilea, 100; vestita, 109, 116
Maryland, Botrychium matricariae folium in, 137
MASSEY, A.B. Ferns and fern allies of Amelia Co., Virginia (review), 63
MATTHEWS, V. D. Ferns and fern allies of South Carolina, 73, 119
MERRILL, E. D. New Philippine Isoetes, 18
Metrosideros collina, var. polymorpha, 14
Metzgeria myriopoda, 26
MEYER, S. L. Pteridophyta of a Virginia bog (review), 63
Microlepia strigosa, 14; tenuifolia, 16
Mnium affine ciliare, 26; hornum, 27
Moa, 16; Pipi, 16
MOORE, D. M. Arkansas pteridophyta, 105; Selaginella rupestris in Arkansas, 50
Myriophyllum proserpinacoides, 103; tenellum, 69

Nephrodium marginale f. Braillae, 89, f. tripinnatifidum, 89
Nephrolepis exaltata, 14
Notholaena dealbata, 4, 8, 113

Obituary. Pickett, F. L., 139

Odontosoria chinensis, 16
Okupukupu, 14
Onoclea sensibilis, 4, 7, 46, 110, 126,, f. **acutisegmenta,** 46, f. obtusilobata, 126
Ophioderma pendulum β falcatum, 10
Ophioglossum concinnum, 10; crotalophoroides, 77; Engelmanni, 5, 7, 108, 115; **falcatum,** 10; nudicaule, 78; pendulum, 10; pusillum, 78; tenerum, 78; vulgatum, 37, 115, 137
Osmunda, a hybrid, 65; cinnamomea, 46, 69, 79, 108, 115, f. bipinnatifida, 46, f. frondosa, 46, 115, f. incisa, 46, f. latipinnula, 46; Claytoniana, 46, 65, 66, 108, 115; Claytoniana × regalis, var. spectabilis, 65; regalis, 79, var. spectabilis, 46, 65, 66, 108, 115; × **Ruggii,** 65, 66; spectabilis, 115
Owalli, 12, 15

Pai, 15
Palapalai, 14; O Kaumaapua, 13
PALMER, E. J. Adventures in fern collecting, III, 1
Pamoho, 12
PARKS, H. B. Notes on Texas ferns, 56
Pellaea atropurpurea, 8, 95, 113, 127, f. cristata, 107, 113; glabella, 95, 107, 113; ternifolia, 14
Pennsylvania, additions to the fern flora of Lake Shehawken, 137; ferns of the Kutztown-Fleetwood area, 41, 89
Pepper, water, 116
Pepperwort, hairy, 116
PERRY, L. M. New Philippine Isoetes, 18
Phegopteris Dryopteris, 91; hexagonoptera, 91, 111, 127; polycarpa, 14; polypodioides, 91; unidentata, 14. See also Dryopteris.
Philippine Isoetes, a new, 18
Phyllitis Scolopendrium, 130
Phymatodes elongata, 15
PICKETT, F. L. Obituary notice, 139
Piipiilau Manamana, 12
Pillwort, 116
Pilularia, 99, 100; in Texas, 99; americana, 99, 101, 116
Plagiothecium denticulatum, 26; subfalcatum, 26; turfaceum, 26
Pololei, 10
Polypodium Hookeri, 15; hymenophylloides, 15; lineare, 15; pellucidum, 15; plumula, 71; polypodioides, 6, 115, 128; pseudogrammitis, 15; Saffordii, 15; sarmentosum, 15; serrulatum, 15; tamariscinum, 15; virginianum, 95, 115, 128, f. acuminatum, 95, f. biserratum, 95, f. elongatum, 95; vulgare, 129
Polypody, common, 114, 128; gray, 6, 30, 114, 128; Hooker's, 15; pellucid, 15
Polystichum, 51; acrostichoides, 8, 48, 81, 83, 111, 128, 130, natural hybrid with P. Braunii, 81, f. crispum, 48, f. incisum, 48, 111, f. **ligulatum,** 48, f. multifidum, 48, f. recurvatum, 48, var. Schweinitzii, 86, 112; aculeatum, 88, 134, 135, var. Braunii, 88; angulare, 130, 135; Braunii, 66, 81, 83, 130, natural hybrid with P. acrostichoides, 81; californicum, 88; Dudleyi, 88; Lemmoni, 88; lobatum, 135; setiferum, 135
Porotrichum alleghaniense, 26
Psilotum complanatum, 16; nudum, 16, 70; triquetrum, 16
Pteretis nodulosa, 47
Pteridium aquilinum, 15, 131; latiusculum, 8, 94, 114, var. pseudocaudatum, 94, 114. See also Pteris
Pteris aquilina, 15, 114; cretica, 15, 71; cretica Wilsonii, 71; decora, 13; excelsa, 15; irregularis, 17; longifolio, 15; multifida, 27, 71. See also Pteridium

Quillwort, 5, 117; Butler's, 117

Radula Sullivantii, 26
Recent fern literature, 30, 62, 102, 132
Regnellidium, 100
Report of judge of elections, 36; of president, 32; of secretary, 34; of treasurer, 35
Reviews: Abbey, F. M., our native ferns and their cultivation, 102; Alston, A. H. G., correct application of the name Polystichum aculeatum, 135; Blomquist & Correll, county check-list of North Carolina ferns, 134; Brooks, M. G., pteridophytes of West Virginia, 31; Featherly & Russell, ferns of Oklahoma, 102; Hamblin, S. F., Lexington leaflets, 31; Lewis & Massey, ferns of Amelia County, Virginia, 63; Meyer, S. L., pteridophyta of a Virginia bog, 63; Schaffner & Liang-Ching Li, Chinese species of Equisetum, 62; Scully, F. J., ferns of Hot Springs, Arkansas, 135; Wherry, E. T., notable Pennsylvania ferns, 62; Woodward, C., hardy ferns and their culture, 132
Rhododendron maximum, 69
Riccardia sinuata, var. major, 26
RUGG, H. G. A summer in northern Europe, 129
RUSSELL, C. S. Ferns of Oklahoma (review), 102

Sadleria cyatheoides, 15; Hillebrandii, 16

Salvinia, 101
SCHAFFNER, J. H. Chinese species of Equisetum (review), 62
Sciaromium Lescurii, 26
Scouring rush, smooth, 116; tall, 116
SCULLY, F. J. Ferns of the Hot Springs National Park, Arkansas (review), 135
Sedum Nuttallianum, 51; pulchellum, 51
Selaginella, 6; apoda, 97, 109, 117; apus, 109; arbuscula, 17; Menziesii, 17; rupestris, 4, 5, 9, 50, 51, 95, 98, 109, 117, in Arkansas, 50
Selaginella, creeping, 117
Sematophyllum carolinianum, 26
Shortia galacifolia, 21
South Carolina, ferns of, 73, 119; station for Hymenophyllum in, 21
Sphenomeris chusana, 16
Spike-moss, rock, 117
Spleenwort, black stemmed, 113, 121; Bradley's, 112, 120; ebony, 113, 121; lobed, 121; maidenhair, 6, 12, 113, 122, 129; mountain, 121; narrow-leaved, 112; pinnatifid, 112; rue, 129; Scott's, 28, 29, 107, 113, 136, fertile, 28; silvery, 30, 124; smaller, 113; varicolored, 121
SPURR, S. H. Northward extension of range for Hypolepis repens, 28
SVENSON, H. K. Report of the treasurer for 1939, 35
Syrrhopodon texanus, 26

Talinum calycinum, 51; parviflorum, 51
Tectaria heracleifolia, 58, 60, 61, 71
Texas, notes on ferns of, 56; Pilularia in, 99
Thelypteris noveboracensis, 91, f. fragrans, 91; palustris var. pubescens, 90, f. **frondosa,** 91, f. **serratipinnula,** 91; simulata, 91. See also Dryopteris
THOMPSON, R. H. Natural hybrid between Polystichum acrostichoides and P. Braunii, 81
Thuidium delicatulum, 26
TRACY, H. H. Cyrtomium in southern California, 52
Trichocolea tomentella, 26
Trichomanes Bauerianum, 17; Boschianum, 79; davallioides, 11; Petersii, 22, 64
TRYON, R. M., JR. An Osmunda hybrid, 65

Uluhe, 10

WAGNER, W. H. JR. New localities for Botrychium matricariaefolium in Maryland, 137
Waimakanui, 15
Wahine Noho Mauna, 15
Wawaeiole, 16
West Virginia, range extensions in, 136
WHERRY, E. T. Notable Pennsylvania ferns (review), 62
WHITNEY, E. G. Report of the Columbus meeting, 37; of the secretary for 1939, 34
Woodsia, 31; ilvensis, 47, 95; obtusa, 47, 110, 123; scopulina, 105, 110
Woodsia, blunt lobed, 110; Rocky Mountain, 105, 110
WOODWARD, C. Hardy ferns and their culture, (review), 132
Woodwardia areolata, 114; virginica, 94, 114. See also Anchistea and Lorinseria

ERRATA

Page 45, line 17, for (Gmel)., read (Gmel.)
" 65, " 26, for type specimen, read Bradley specimen
" 66, " 1, for *O. Weatherbiana*, read *O. Ruggii*
" 91, " 16, for forma **fragrans** (Peck), n. comb. read forma FRAGRANS (Peck) Dole
" 92, last line, for forma **serratum** (Lawson), n. comb., read forma SERRATUM (Lawson) Gruber

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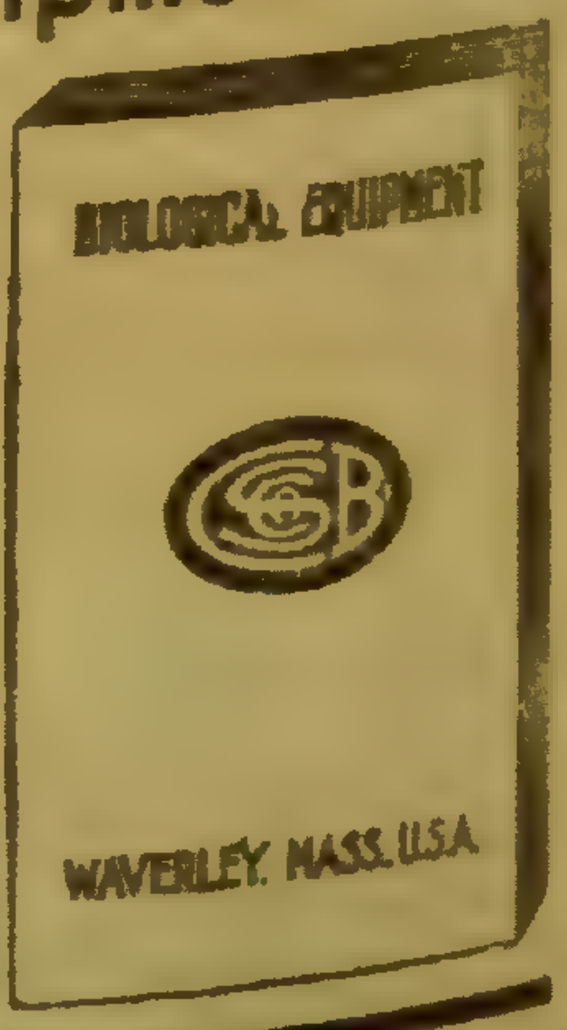

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American Fern Journal

A QUARTERLY DEVOTED TO FERNS

Published by the

AMERICAN FERN SOCIETY

EDITORS

WILLIAM R. MAXON

R. C. BENEDICT C. V. MORTON

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VOLUME 31

1 9 4 1

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CONTENTS

VOLUME 31, NUMBER 1, PAGES 1–40, ISSUED APRIL 4, 1941

Charles Alfred Weatherby and the American Fern Jounal.
R. C. Benedict 1

The Ferns and Fern Allies of South Carolina (conclusion).
Velma D. Matthews 4

On the Florida Fern Known as Dryopteris setigera.
C. V. Morton 12

Hybrid Woodsias in Minnesota ..... *F. K. Butters* 15

Shorter Notes: Asplenium Bradleyi in Ohio; New Localities for Botrychium matricariaefolium in Maryland; Ferns in the News 21

Recent Fern Literature 24

American Fern Society 29

VOLUME 31, NO. 2, PAGES 41–80, ISSUED MAY 27, 1941

The American Fern Journal Through Thirty Years.
R. C. Benedict 41

New Stations for Florida Pteridophytes ..... *Mary W. Diddell* 48

New Lycopodium Gametophytes from New Jersey.
Hollis Koster 53

Lawson's Type Specimens ..... *C. A. Weatherby* 59

Some Noteworthy Fern Communities of Arkansas.
Dwight W. Moore 63

Shorter Notes 71

Recent Fern Literature 75

American Fern Society 77

VOLUME 31, NO. 3, PAGES 81–120, ISSUED AUGUST 18, 1941

State and Local Fern Floras of the United States ... *S. F. Blake* 81

Factors Determining the Distribution of Florida Ferns.
Stephen H. Spurr 91

Asplenium adiantum-nigrum in Arizona ..... *Edgar T. Wherry* 97

Beware of "Lycopodium"! ..... *Charles Whitebread* 100

Notes on Dominica Ferns ..... *W. H. Hodge* 103

Shorter Notes 112

Recent Literature 115

American Fern Society 118

VOLUME 31, NO. 4, PAGES 121–160, ISSUED DECEMBER 17, 1941

Notes on Dominica Ferns (conclusion) ..... *W. H. Hodge* 121
The Gold Rush: A Fern Ally ..... *R. C. Benedict* 127
State and Local Fern Floras of the United States (conclusion). *S. F. Blake* 131
Habitats and Distribution of Ophioglossum in Florida. *Edward P. St. John* 143
Recent Fern Literature 148
American Fern Society 152
Index to Volume 31 157

Vol. 31 January-March, 1941 No. 1

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American Fern Journal

Vol. 31 January–March, 1941 No. 1

Charles Alfred Weatherby and the American Fern Journal

R. C. Benedict

In 1910, the first two numbers of the American Fern Journal were offered as an experiment, to see whether the Fern Society would care to undertake the publication of its own organ. Starting with 1911, the Journal was regularly adopted, and now it can celebrate the completion of its thirtieth volume. During the first four years there were several changes in responsibility for its management, with Philip Dowell and R. C. Benedict dividing the editorial work and E. J. Winslow carrying the general and detailed tasks of business management, advertising, mailing each issue, storing back numbers, etc. These latter were onerous tasks which Mr. Winslow carried on for many years. His resignation was reluctantly accepted after twenty-five years of service.

The work of editing the Journal called for an additional staff member, and late in 1914 President C. H. Bissell suggested C. A. Weatherby, who had been Secretary of the Society the year previous and who had contributed botanically and editorially to the publication of the "Catalogue of the Flowering Plants and Ferns of Connecticut," with Mr. Bissell and others.

No more fortunate nomination could have been made. Through the twenty-six years which have since elapsed.

[Volume 30, No. 4 of the Journal, pages 105–144, was issued January 10, 1941.]

Mr. Weatherby's literary and scientific scholarship have combined to make the American Fern Journal one of the best edited of science magazines. I can say that with good grace, despite the fact that during most of this period my name has stood at the head of the list of editors of the JOURNAL. Increasingly from the first, C. A. W. carried the main load of editorial work. More than once I urged that the title "editor-in-chief" be set after the name "Weatherby"; but since he was handling the proof and had the last say as to the set-up of the JOURNAL, my proposals were not accepted. Now he's through and I can say what I please!

Mr. Weatherby brought to the service of the Society much more than his own scholarly background. In a letter written early in his editorial connection with the JOURNAL, referring to the desirability of illustrations for a certain fern group, he let it be known that he had a friend, a Miss Foster, who was very generous of her time and talents as an artist, and presently Mrs. Weatherby-to-be contributed the first of a series of valued and discriminating drawings of fern types. Of his help to the JOURNAL when the Society had suffered a severe financial loss, and there were no funds with which to pay printers' bills, I shall say no more than that his aid has been exceeded only by the late President Bissell's bequest of five hundred dollars as an herbarium fund.

In another early letter Mr. Weatherby more than intimated that although ferns were all right he thought grasses were probably more interesting! I have heard no repetition of this heresy for many years. His interest in vascular plants is catholic and his knowledge wide-reaching, yet I am sure we may consider his days of vacillation as long past. The latest edition of American Men of Science records his field as "taxonomy of vascular plants, especially American ferns." And in that

group, a present special interest in the difficult genus *Notholaena* may be cited.

It is my understanding that Mr. Weatherby, like so many members of the Fern Society, did not start out as a botanist, let alone a pteridologist. To our varied membership of theologians, engineers, geologists, English scholars, gardeners, college football coaches, business men, and the like, the subject of these paragraphs added the philologist. Certainly that training provided an excellent background for editorial work. But editorial work requires the possession of many attributes besides technical knowledge and care and precision with respect to language. At times manuscripts are received that leave much to be desired on the score of legibility or are faulty in English construction. Sometimes also some of the subject matter may be erroneous, of doubtful value, or stated at too great length. Naturally, such articles require editorial revision; and in this delicate task the friendly criticisms by C. A. W. have invariably been given with the utmost consideration, helpfulness, and tact.

New Englanders are notably reticent, not given to volubility in the expression of personal views and philosophy. However, it is possible at times to discover a man's aims and point of view indirectly, by noting how he appraises others and what he admires in them. Read Mr. Weatherby's tribute to C. H. Bissell, in Volume 15 of the JOURNAL. From that I quote, with a minor modification, a sentence which most appropriately characterizes Charles Alfred Weatherby today: "A man to whom his fellow members turn with entire confidence in any matter which calls for perfect integrity, sound judgment, and constructive ability."

BROOKLYN BOTANIC GARDEN AND
BROOKLYN COLLEGE

The Ferns and Fern Allies of South Carolina

VELMA D. MATTHEWS

(*Continued from Volume 30, page 128*)

17. PTERIDIUM Scop.

1. PTERIDIUM LATIUSCULUM (Desv.) Hieron.

Bracken Fern.

Fields, woods and in many types of soil, but most abundant in sandy regions. It is found from the coast to the mountains. Most of the following records represent the variety *pseudocaudatum*. Counties: Aiken, Allendale, Anderson, Bamberg, Beaufort, Berkeley, Charleston, Chesterfield, Clarendon, Colleton, Darlington, Dillon, Dorchester, Edgefield, Florence, Georgetown, Greenville, Hampton, Horry, Jasper, Kershaw, Lee, Lexington, Marlboro, McCormick, Oconee, Orangeburg, Pickens, Williamsburg, and York.

18. PTERIS L.

1. PTERIS MULTIFIDA Poir. Spider Brake.

On old walls, on rocks, and in regions where lime is present. Escaped from cultivation. For an interesting discussion on this fern in South Carolina see Miss Bragg's account in the Bulletin of the Charleston Museum **10**: 19. 1914. Counties. BEAUFORT: *Matthews* (CC). BERKELEY: Walter's Botanic Garden on the Santee River. *Small* (NY); locks of the Santee Canal near Walter's place, *Eggleston* (NY); *Coker* (NC). CHARLESTON: Charleston, *Small* (NY), *Curtis* (US, NY, NC, A), *Richardson* (NC), *Coker* (NC), *Matthews* (CC), *Correll* (D). *Smith* (A, US). DORCHESTER: Summerville, *Matthews* and *Hewitt* (CC). GEORGETOWN: Georgetown, *Coker* (NC). RICHLAND: Columbia, *Martin* (Ch.).

2. PTERIS VITTATA L. Ladder Brake.

On brick walls in Charleston. Counties. CHARLESTON: on walls in Charleston, *Bragg* (Ch.), *Richardson* (NC), and *Matthews* (CC).

19. THELYPTERIS Schmidel.

1. THELYPTERIS NORMALIS (C. Chr.) Moxley.
Christensen's Marsh-Fern.

Moist woods, and rocky slopes, chiefly in calcareous regions in the coastal plain. Some of the specimens listed below might be placed in different species by specialists who follow Small. This fern grows in great profusion on moist banks along the Edisto River in Givhans Ferry State Park. Here the fronds often reach a length of 3 feet. On the other hand, plants growing on walls in dry places may have fronds only a few inches in length. For a report on this species in Berkeley County see this JOURNAL **26**: 127. 1936. Counties. BEAUFORT: on ruins of Old Sheldon's Church near Garden's Corner, *Matthews* (CC). BERKELEY: on a tomb at Goose Creek Church, *Bragg* (Ch., G); along Santee Canal 2 miles northeast of Moncks Corner, *Wherry* (A, G). DORCHESTER: bluff along Edisto River in Givhans Ferry State Park, *Matthews* (C). ORANGEBURG: Eutaw Springs, *Ravenel* (G),—(Ch.), *Matthews* and *Hewitt* (CC), *Clausen* and *Trapido* (B, CC).

2. THELYPTERIS NOVEBORACENSIS (L.) Nieuwl.
New York Fern.

Moist woods. Counties. CHEROKEE: Brown's Mt., *Wherry* (A). GREENVILLE: Jones' Gap, *Leeds* (A); Caesar's Head, *Bragg* (Ch.), *Philson* (CC); Hogback Mt., *Smith* and *Hewitt* (CC); Blythe Shoals, *Thomason* (F). OCONEE: Callas Gap north of Mountain Rest, *Wherry* (A); Oconee State Park, *Matthews* and *Holland.*

PICKENS: Round Top Mt., *Correll* (D),—*Anderson* (US, NY); Sassafras Mt., *Clausen* and *Trapido* (B, CC); Rocky Bottom, *Matthews* and *Holland* (CC). SPARTANBURG: 1 mile west of Spartanburg, *Matthews* and *Holland* (CC).

3. THELYPTERIS PALUSTRIS Schott. Marsh Fern.

Moist woods and swamps. Counties. AIKEN: Aiken, *Ferguson* (NY). ANDERSON: Anderson, *Davis* (US, G, A). BERKELEY: Pinopolis, *Matthews* and *Hewitt* (CC). CHARLESTON: Navy Yard at Charleston—(Ch.); 6 miles north of Charleston, *Wherry* (A). DARLINGTON: Hartsville, *Matthews* and *Smith* (CC). GEORGETOWN: near Brookgreen, *Tarbox* (NY), *Matthews* and *Hewitt* (CC). HORRY: Myrtle Beach, *Coker* (NC); south of Myrtle Beach, *Matthews* and *Hewitt* (CC).

20. WOODSIA R. Br.

1. WOODSIA OBTUSA (Spreng.) Torr.
Blunt-lobed Woodsia.

On rocks or rocky slopes. Counties. AIKEN: Aiken, *Canby* (US). DARLINGTON: Hartsville, *Matthews* (CC). EDGEFIELD: on pink granite along highway #43, 10 miles from McCormick, *Matthews* (CC). GREENVILLE: Caesar's Head,—(Ch.). LANCASTER: Forty-acre Rock, *Matthews* and *Boland* (CC). LEXINGTON: Peach-tree Rock, *Philson* (CC, SC).

Order 3. SALVINIALES

Family 1. SALVINIACEAE Salvinia Family

1. AZOLLA Lam.

1. AZOLLA CAROLINIANA Willd. Water Fern.

Floating in still water of ponds and canals. Counties. BERKELEY: Santee Canal, *Ravenel* (Ch., NY). DOR-

CHESTER: 12 miles southwest of Summerville, *Leeds* (A).
KERSHAW: Camden, *H. D. House* (US, NY).

Order 4. LYCOPODIALES

Family 1. PSILOTACEAE — Psilotum Family

1. PSILOTUM R. Br.

1. PSILOTUM NUDUM (L.) Griseb. — Whisk Fern.

On bark of trees and at the base of trees. This species has not been collected in the state in recent years. There is the following note by Mellichamp in the Bulletin of the Torrey Botanical Club 9: 128. 1882: "New Station for *Psilotum triquetrum*, Swartz. Last week I found here six or eight specimens of this plant growing under a live oak and pine. It has been identified by Dr. Gray, to whom I sent it, and also by Mr. Ravenel of Aiken, S. C., who informs me that thirty-five years ago he met with the same in St. John's—Berkeley, in this State, but that he has not seen it since. He found about a half dozen specimens growing in an old deserted garden, under 'wild orange trees.' Bluffton, S. C., Sept. 18, 1882." There is one specimen at the New York Botanical Garden with the label: "In an old neglected garden, South Carolina. Ex. Rev. Dr. M. A. Curtis, 1859." It is not clear whether Curtis really collected this or perhaps received it from Ravenel. Counties. BEAUFORT: Bluffton, *Mellichamp* dated 1887 (NY), also Bluffton, *Mellichamp* dated April 14, 1894 (US), also a collection marked Bluffton in the Ravenel collection at Converse College. BERKELEY: Santee Canal, *Ravenel* (Ch.), also no doubt from the same locality a collection at Converse with the label "parasitic on roots? of *Cerasus caroliniana*, S. C."

Family 2. LYCOPODIACEAE Club-Moss Family

LYCOPODIUM L.

1. LYCOPODIUM ADPRESSUM (Chapm.) Lloyd & Underw. Chapman's Club-Moss.

Boggy swamps and savannahs. *Lycopodium adpressum* forma *polyclavatum* McDonald is rather abundant in one flat at Hartsville. Counties. ALLENDALE: west of Allendale, *Wherry* (A). CHARLESTON: Adams Run. *Correll* (D). CLARENDON: north of Manning, *Stone* (A); Wilson's Mill, *Stone* (A). DARLINGTON: Hartsville, *Coker* (A, NC), *Matthews* (CC). DILLON: north of Dillon, *Matthews* and *Smith* (CC). KERSHAW: Camden, *H. D. House* (US).

2. LYCOPODIUM ALOPECUROIDES L. Foxtail Club-Moss.

Swamps and savannahs. Counties. AIKEN: Aiken State Park, *Matthews* (CC). BEAUFORT: Dale, *Gibson* (CC). BERKELEY: Santee Canal, *Ravenel* (Ch.); Pineville, *Matthews* and *Hewitt* (CC). CHESTERFIELD: McBee, *Matthews* and *Smith* (CC); Meddendorf, *Oosting* (D). CLARENDON: Alcolu and Manning, *Stone* (A). COLLETON: along highway #65, *Matthews* (CC). DARLINGTON: Hartsville, *Hewitt* (CC), *Norton* (US); Society Hill, *Matthews* (CC). DILLON: north of Dillon, *Matthews* and *Smith*. DORCHESTER: Summerville,—(Ch.). GEORGETOWN: —, *Correll* (D). HORRY: Myrtle Beach. *Batson* (F). LEXINGTON: Congaree Creek, — (CC). ORANGEBURG: Eutawville, *Eggleston* (G). SUMTER: Cane Savannah, *Stone* (A); Sumter, *Bartram* (A).

3. LYCOPODIUM CAROLINIANUM L. Carolina Club-Moss.

Moist meadows and wet sandy places, in sterile, acid soil. Counties. AIKEN: Aiken, *Ravenel* (US, G). ALLENDALE: west of Allendale, *Wherry* (A). DARLING-

TON: Hartsville, *Norton* (US), *Matthews* (CC). GEORGETOWN: —, *Correll* (D).

4. LYCOPODIUM FLABELLIFORME (Fernald) Blanchard. Running Pine.

Dry or moist woods. Counties. CHESTER: south of Chester, *Caldwell* (CC). GREENVILLE: Stone's Lake 2 miles east of Greenville, *Loomis* (A); Easley, *Fullbright* (F). LAURENS: — (Cl.). PICKENS: northwest of Easley, *Clausen* and *Trapido* (CC).

5. LYCOPODIUM LUCIDULUM Michx. Shining Club-Moss.

Moist woods and along streams. Counties. GREENVILLE: below Rainbow Falls, — (CC), *Kelley* (F); Marietta, *Thomason* (CC); 5 miles northeast of Merritsville, *Wherry* (A); ravine of Mathews Creek below Raven Cliff, *Wherry* (A). PICKENS: Round Top Mt., *Correll* (D).

6. LYCOPODIUM OBSCURUM L. Ground Pine.

Moist woods. Counties. GREENVILLE: Caesar's Head, — (Ch.).

7. LYCOPODIUM PROSTRATUM Harper. Southern Club-Moss.

Swamps and wet pine lands of the coastal plain. Counties. BEAUFORT: Hardeeville, *Smith* (US). CHARLESTON: Adams Run, *Correll* (D). CLARENDON: 5 miles east of Manning, *Stone* (A).

8. LYCOPODIUM SELAGO var. PATENS (Beauv.) Desv. Rock Club-Moss.

Moist shaded slopes and ledges. Counties. GREENVILLE: Falls of the Saluda, *Smith* (US); base of Rainbow Falls 4 miles east of Jones Gap, *Wherry* (A); below Rainbow Falls, 2 miles northwest of Middle Saluda, altitude 2,500 ft., *Clausen* and *Trapido* (B, CC).

Family 3. SELAGINELLACEAE. Spike-Moss Family.

SELAGINELLA Beauv.

1. SELAGINELLA ACANTHONOTA Underw.

Sand Selaginella.

Sand hills and sandy soil. Counties. GREENVILLE: Paris Mt., Mackenzie (US) (the authenticity of this specimen is open to question). HORRY: 12 miles northwest of Green Sea, *Wherry* (A). LEXINGTON: 2 miles northeast of Edmond, *Wherry* (A). RICHLAND: Columbia, *Henry* (A).

2. SELAGINELLA APODA (L.) Fernald.

Creeping Selaginella.

Moist shady places, especially along small streams. Counties. BERKELEY: Pinopolis and Pineville, *Matthews* and *Hewitt* (CC); Santee Canal, *Ravenel* (Ch.). CHARLESTON: Navy Yard, *Bragg* (Ch.); Bulow Mines, *Foster* (CC). CHEROKEE: Gaffney, *Matthews* (CC); east of Blacksburg, *Wherry* (A). DARLINGTON: Society Hill, *Smith* (CC). DORCHESTER: Givhans Ferry State Park, *Matthews* (CC); Summerville, *Matthews* and *Hewitt* (CC); Middleton Gardens, *Davidson* (CC). EDGEFIELD: Sleepy Creek, *Fooshe* (CC). GEORGETOWN: Pawley's Island, *Matthews* (CC); near Brookgreen, *Matthews* and *Hewitt* (CC). GREENVILLE: Rainbow Falls, *Philson* (CC, SC) and *Massey* (CC); southeast of Venus P. O., *Wherry* (A). HORRY: south of Myrtle Beach, *Matthews* and *Hewitt* (CC). LANCASTER: Forty-acre Rock and swamp near Lynch's River, *Matthews* (CC). LEE: Lee State Park, *Matthews* (CC). OCONEE: near Jocassee, *Correll* and *Barksdale* (D). PICKENS: northwest of Easley, *Clausen* and *Trapido* (B, CC); south slope of Table Rock Mt., *Wherry* (A). MCCORMICK: McCormick, *Matthews* and *Fooshe* (CC).

3. SELAGINELLA RUPESTRIS (L.) Spring.

Rock Selaginella.

On rocks and on sandy slopes. Counties. CHESTERFIELD: Sugar Loaf Mt., *Matthews* and *Hewitt* (CC). GREENVILLE: Hogback Mt., *Wherry* (A); Paris Mt., *Wherry* (A); *Mackenzie* (US), *Powell* (CC), *Clausen* and *Trapido* (B, CC). LEE: Lee State Park, *Matthews* (CC). LEXINGTON: Peach Tree Rock, *Philson* (SC, CC).

4. SELAGINELLA TORTIPILA A. Br.

Southern Rock-Selaginella.

On ledges of rock. Counties. GREENVILLE: Caesar's Head, *Smith* (G), *Blomquist* (D), *Leeds* (A); Paris Mt. — (CC). PICKENS: Round Top Mt., *Correll* (D); Table Rock, *Clausen* and *Trapido* (B, CC), — (G), *Ives* and *Radford* (F).

Order 5. EQUISETALES

Family 1. EQUISETACEAE. Horsetail Family.

1. EQUISETUM L.

1. EQUISETUM PRAEALTUM Raf. Giant Horsetail.

Growing in limestone regions. Counties. CHEROKEE: Gaffney, *Matthews* (CC, A). This Equisetum is very abundant along a small stream on the Limestone College campus. I am indebted to Dr. P. J. Philson for pointing out this location.

Order 6. ISOETALES

Family 1. ISOETACEAE. Quillwort Family.

1. ISOETES L.

1. ISOETES ENGELMANNI A. Br. Appalachian Quillwort.

Growing in mud or in water, often entirely submerged. Counties. AIKEN: near Graniteville, *Eggert* (M). DAR-

LINGTON: Prestwood Lake, Hartsville, *Matthews* (CC). DORCHESTER: south of Summerville, *Correll* (D). GREENVILLE: lake near Cedar Mt., *Bold* (CC). MARLBORO: stream near Drake's Mill, *Matthews* (CC). *Isoetes engelmanni* var. *caroliniana* A. A. Eaton, YORK: $2\frac{1}{4}$ miles north of Clover, *Wherry* (A).

COKER COLLEGE, HARTSVILLE, S. C.

On the Florida Fern Known as Dryopteris setigera[1]

C. V. MORTON

In recent years an Asiatic fern which has been identified as *Dryopteris setigera* (Blume) Kuntze has become rather commonly naturalized in Florida. It is a noteworthy plant, with finely dissected fronds, and is easily distinguished by the abundant acicular hairs on the costules and veins. The nomenclature of this species is, however, exceedingly involved. Ching,[2] who has recently discussed it, remarks that "the nomenclatural confusion for this widely distributed but constant fern is almost unthinkable," but it must be confessed that his treatment has only served to increase the confusion.

In the third supplement of Index Filicum (1934) Christensen adopted the name *D. uliginosa* (Kunze) C. Chr. It was Hooker and Baker[3] who first identified *Cheilanthes setigera* Blume with *Aspidium uliginosum* Kunze, and their treatment was accepted by subsequent authors until 1917. At that time Dr. E. Rosenstock saw Blume's type and identified it with *Polypodium ornatum*

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[1] Published by permission of the Secretary of the Smithsonian Institution.

[2] Bull. Fan Mem. Inst. Biol. 6: 339–347. 1936.

[3] Syn. Fil. ed. 1, 284. 1867.

Wall., i.e. *Dryopteris ornata* (Wall.) C. Chr. This is a quite different fern, with muricate stipe and rhachis and scaly costae. For the species that had previously been known as *setigera* he used the name *Dryopteris trichodes* (Reinw.) Rosenst., based on *Polypodium trichodes* Reinw.; but the latter is a *nomen nudum*, and need not be taken into consideration. The earliest available name is *Aspidium uliginosum* Kunze, and the species must be known as *Dryopteris uliginosa*.

In 1923 Dr. Maxon[4] correctly segregated three species and pointed out the essential differences between them. For these he used the names *D. setigera*, *D. ornata*, and *D. leucolepis*. Not having access to Blume's type, he applied the name *setigera* in the usual sense to *Aspidium uliginosum*, there being nothing in Blume's original description to indicate that this was incorrect. However, Dr. Rosenstock's comments indicate a clear understanding of the differences between the species concerned, and since he actually saw the type his identification of it with *D. ornata* is presumably correct.

Ching's recent treatment, in which an attempt is made to distinguish five species in this group, is scarcely to be interpreted without access to the material on which he worked. However, it is obviously incorrect as regards the interpretation of *Dryopteris uliginosa*, which Ching characterizes as exindusiate. *Aspidium uliginosum* was based on plants cultivated in the Berlin Botanical Garden, originally from Java. There is a specimen in the U. S. National Herbarium which is probably type material, and this shows indusia distinctly. Moreover, almost all the specimens of this species that I have examined are indusiate, including some (e.g. *How & Chun* 70241 from Hainan) cited by Ching. *Dryopteris oligophlebia* (Baker) C. Chr., which Ching recognizes as distinct on the basis of indusia being present, is therefore probably

[4] Proc. Biol. Soc. Washington 36: 170–173. 1923.

a synonym of *D. uliginosa.* At least, the presence or absence of an indusium is not a distinction between the two. Furthermore, Ching does not identify the true *D. setigera* with *D. ornata*, as do Rosenstock and Christensen, but keeps them distinct on a similar basis; *D. ornata* is said to be exindusiate, *D. setigera* indusiate. The material at hand from India and tropical Asia is insufficient to decide on the validity of this treatment; but it must be considered doubtful, particularly since there is no indication that Ching ever saw the type of Blume's species.

To summarize, it may be said that in so far as the plant naturalized in Florida and various parts of tropical America is concerned the situation is clear. This species must be known as *Dryopteris uliginosa* (Kunze) C. Chr., the more important synonymy being as follows:

DRYOPTERIS ULIGINOSA (Kunze) C. Chr. Ind. Fil. Suppl. 3: 100. 1934.

Aspidium uliginosum Kunze, Linnaea **20**: 6. 1847.

Polypodium nemorale Brack. U. S. Expl. Exped. **16**: 16. 1854.

Polypodium tenericaule Wall. List no. 335. 1828 (nomen nudum); Hook. Journ. Misc. Bot. Kew **9**: 353. 1857.

Nephrodium tenericaule Hook. Sp. Fil. **4**: 142. 1862 (excl. pl.).

Dryopteris tenericaulis Ching, Sinensia **3**: 325. 1933.

Thelypteris uliginosa Ching, Bull. Fan Mem. Inst. Biol. **6**: 342. 1936.

Dryopteris setigera auctt. plur., non *Cheilanthes setigera* Blume.

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Hybrid Woodsias in Minnesota

F. K. BUTTERS

In a study of the ferns collected in recent years in Cook County, Minnesota (the northeast corner of the state), several peculiar Woodsia specimens have come to light which appear to be hybrids. Five species of Woodsia are known to occur in the county,[1] and in a few places all five have been collected within a radius of a few hundred yards, so that hybridity is to be expected wherever it is biologically possible. Up to date, however, only two of the possible combinations have been noted.

1. × **Woodsia gracilis** (Lawson) comb. nov.
   Woodsia alpina × *ilvensis* H. V. Rosendahl, Svensk Botanisk Tidskrift IX, 418. 1915.
   Woodsia ilvensis β *gracilis* Lawson, Edinb. New Philos. Journ., N. S. XIX, 281. 1864.

For some years occasional specimens have been collected of a fern obviously close to *W. ilvensis*, but much less chaffy and with shorter, wider, and relatively more distant pinnae. Some of these plants have been tentatively identified as *W. alpina*, others as *W. ilvensis*, but from year to year they have puzzled me in the field, and had almost convinced me that those European botanists are correct who follow Milde in regarding *W. ilvensis* and *W. alpina* as varieties of a single polymorphic species. However, a collection made in the summer of 1938 threw

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[1] *W. ilvensis*, *W. alpina*, *W. glabella*, *W. scopulina*, and *W. Cathcartiana*. Of these *W. ilvensis* is ubiquitous, *W. scopulina* locally abundant at a considerable number of stations, *W. Cathcartiana* considerably more localized, but abundant at a few stations, while the other two species are both local and scarce. *W. obtusa* occurs in southeastern Minnesota but appears to be entirely absent from the northern half of the state.

much light on the real state of affairs. This collection, the first cited below, consists of several plants of the fern in question together with a single well developed specimen of typical *W. alpina*. Every frond of the latter is in heavy fruit with many of the sporangia ripe and the spores quite normal. In the other plants, however, while the fronds are larger than those of *W. alpina*, and apparently in a perfectly healthy condition, and there are very numerous sori, the sporangia are all shrivelled and obviously abortive with no good spores. A re-examination of the earlier collections of the plant shows a similar condition. It is quite evident that we are dealing with a sterile hybrid the characters of which are entirely intermediate between the parent species. In northeastern Minnesota the hybrid is considerably more abundant than typical *W. alpina*, but this is not surprising, since *W. ilvensis* is overwhelmingly abundant and *W. alpina* very scarce and local. The same hybrid has been reported from Sweden by H. V. Rosendahl,[2] who gives an excellent Latin description of the plant, as well as extended Swedish commentaries upon it. Our plant agrees very well with Rosendahl's description and figure, and also with a Swedish specimen determined by him, now in the herbarium of the University of Minnesota. Some of our specimens are somewhat less hairy than his description implies: "stipites . . . pilis multiarticulatis, ad 2 mm. usque longis, crebris et paleis ad 4 mm. usque longis, fulvis, ovato-lanceolatis, non-nihil fimbriatis, in apicem filiformem longum productis inferne crebrioribus, superne parcioribus vestiti." Some of ours, on the other hand, approach very closely both to this description and to the condition of the Swedish specimens. Rosendahl

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[2] H. V. Rosendahl. Om Woodsia alpina och en sydlig inlandsform af denna samt Woodsia alpina × ilvensis nov. hybr. Svensk Botanisk Tidskrift IV: 414. 1915.

found many of the sporangia abortive, but some ripening to form a few irregular and deformed spores. In our Minnesota specimens I have noted a very few such sporangia—not over 5 or 6 in all the material examined. None appeared to contain viable spores.

Since this hybrid is so widespread it seems desirable to have a convenient binomial name for it, and Lawson's varietal epithet is available. While I have not seen authentic material of his *Woodsia ilvensis* β *gracilis*, which came from Dartmouth River, Gaspé, his description leaves little doubt that he was dealing with the same fern and both of the parent species occur in the Gaspé.[3] It has indeed long been suspected that Lawson's plant was a hybrid.[4]

Finally it may be said that, at least in Minnesota, *Woodsia ilvensis* and *W. alpina* appear to be perfectly distinct and well-marked species, and that the various "intergradations" between them are the result of hybridity and appear to be wholly sterile.

Collections studied. MINNESOTA (all from Cook County): South side of Mountain Lake on second cliff east of the portage to Clearwater Lake, *Butters, Burns and Hendrickson* 126, July 12, 1938; cliffs at west end of Mountain Lake, *Butters, Abbe and Abbe* 244a, July 2, 1939; north-facing cliffs of calcareous slates, Clearwater

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[3] Edinburgh New Philosophical Journal, N. S. **19**: 281. 1864. The same paper appeared also in Canadian Naturalist, N. S. **1**: 262. 1864. I have no evidence as to which publication was the earlier. Since the original description is somewhat inaccessible it may be well to quote it: "β *gracilis*.—Frond more slender, more hairy and less scaly than the type [of *W. ilvensis*]; pinnae rather distant, deeply pinnatified, or partially pinnate. Dartmouth River, Gaspé, John Bell, B.A. In technical characters, this form agrees better with *W. alpina* (*hyperborea*), but it has quite a different aspect."

[4] See C. A. Weatherby, A list of the varieties and forms of the ferns of eastern North America. AM. FERN JOURN. **26**: 11. 1936.

Lake, *Butters and Buell* 397, July 12, 1932; damp shady locations on north side of slate cliff on south side of Clearwater Lake, *Butters, Burns and Hendrickson* 5; small slate ledges 1 mi. east of Grand Portage, *Butters and Moore*, 10884, July 5, 1939.

2. × **Woodsia Abbeae**, hybr. nov.[5]

W. Cathcartiana × *ilvensis.*

Rhizome ascending, often multicipital, clothed with adventitious roots and the dead chaffy bases of old stipes. Fronds of well-grown plants linear-lanceolate, 16–25 cm. long, 2.5–4.5 cm. wide. Stipes slender, curved at the base, not jointed, 3.5–8 cm. long (sometimes appearing longer through the loss of the short-lived basal pinnae) straw-colored when young, soon becoming dark reddish brown and in old age dull purple-black, heavily clothed at the base with pale reddish-brown, lanceolate scales about 4 mm. long, more lightly clothed upward with shorter scales some of which are hair-like as in *W. ilvensis*, puberulent throughout with minute stalked glands about 25 μ in length, in old age sometimes nearly glabrate above the chaffy base. Laminae linear-lanceolate, pinnate-pinnatifid or in part nearly twice pinnate, 8–17 cm. long, 2.5–4.5 cm. wide, at first moderately chaffy throughout with chaffy scales some of them hair-like, also minutely glandular-puberulent, in age losing most of the larger scales.

Pinnae rather remote, 10–15 on each side of the rachis, the lower ones opposite, the upper alternate. Basal pinnae often 2–3 cm. below the much larger second pair, 2–12 mm. long, spatulate or ovate, 3–5-lobed, often withering and disappearing before the frond is wholly mature; middle pinnae ovate-lanceolate to oblong-lanceolate, 1.5–3 cm. long, about 1 cm. wide, deeply pinnatifid below (sometimes essentially pinnate at the very base) crenately lobed above, rounded at the apex, the midrib somewhat sinuous,

[5] × Woodsia **Abbeae** hybr. nov., planta hybrida sterilis stipitibus atropurpurascentibus haud articulatis, laminis forma intermediis inter parentes paleaceis atque pilis minimis glanduliferis puberulis indusio squamis minimis sordidis fimbriatis pilis cylindraceis haud glanduliferis longioribus quam eis *W. Cathcartianae* composito, sporangiis abortivis.

the lateral veins leaving the midrib at a very narrow angle and running nearly parallel to it for some distance before curving out into the respective segments.

Lower segments rather remote, ovate or oblong-ovate, somewhat contracted at the base and strongly decurrent, rounded at the apex, more or less crenately lobed at least toward the base, 4–5 mm. long, about 3 mm. wide, pinnately veined, with the lateral veins mostly once forked. Middle and upper segments much smaller and less deeply separated so that the central undivided part of the pinna has often a distinctly spatulate form.

Sori mostly 1–3 (7) on each fertile segment, small, discrete. Indusium consisting of minute scales ending in hairs which are somewhat longer and more prominent than in *W. Cathcartiana.* Sporangia aborting when about half-grown.

It will be noted that the indument combines the glandular puberulence of *W. Cathcartiana* with the chaffiness of *W. ilvensis* though both types are somewhat reduced in vigor. The degree of chaffiness is very similar to that occurring in × *W. gracilis,* and the glandular puberulence less profuse than in *W. Cathcartiana.* There are none of the long gland-tipped hairs that are so abundant in *W. scopulina,* the only other species of the *W. oregana* group occurring in northern Minnesota. The texture of the frond is intermediate between the rather firm and thick *W. ilvensis* and the exceedingly delicate and thin *W. Cathcartiana.* The cutting of the frond, shape and distance of pinnae and segments, and the degree of freedom of the latter are likewise intermediate. The margin of the segments in *W. ilvensis* is obscurely crenate, in *W. Cathcartiana* crenately lobed often with some minute secondary teeth, and in the hybrid rather deeply crenate but without secondary teeth. In none of these respects is there any suggestion of *W. scopulina.*

This interesting hybrid was first noted by Mrs. E. C. Abbe in August, 1937, while she and her husband were

on a short botanical trip along the Lake Superior shore of Minnesota. They crossed Pigeon Bay, through which the international boundary runs, and made a small collection of plants from some dry slate cliffs on the Canadian side of the bay. Among these were *Woodsia ilvensis*, *W. scopulina*, and a peculiar sterile *Woodsia* with the unarticulated stipes and glandular puberulence of the *W. scopulina-W. Cathcartiana* group combined with chaffy fronds which could have come only from *W. ilvensis*.

When these collections were turned over to me for study, it at first appeared probable that the plant in question was a hybrid of the two species with which it was known to be growing, but it had none of the long, straight, gland-tipped hairs of *W. scopulina*, and the cutting of the frond with its rather remote pinnae and pinnules was far more suggestive of *W. Cathcartiana*. I hesitated, however, to assign this parentage, as the nearest known station for *W. Cathcartiana* was eight miles distant. Last summer, however, my doubts were resolved by two new collections of the same hybrid from quite remote stations, both accompanied by abundant material of both *W. ilvensis* and *W. Cathcartiana* growing in intimate association with it. The plant combines the characters of these two species to such a degree that there is no doubt in my mind that it is a hybrid between them, and that the apparent absence of the latter species from the first locality where the hybrid was found is due to its being overlooked during the brief time that the Abbes had available on their visit there.

Since this hybrid is likely to appear wherever the parent species occur together it has seemed best to me to assign it a binomial name, and it gives me great pleasure to name it for its discoverer, Mrs. E. C. Abbe, whose keen eye for rare ferns has been of great service to me on many occasions.

Collections studied. MINNESOTA: High cliff near "Canadian Border Lodge," Moose Lake, northern St. Louis Co., July 1, 1939, *Olga Lakela;* Cliffs south of John Lake, northern Cook Co., July 1, 1939, *Butters and Moore*, No. 10785. ONTARIO: Thunder Bay District. Dry cliffs on the north side of Pigeon Bay, Lake Superior, August 21, 1937, *E. C. and Lucy B. Abbe*, No. 596 (TYPE, in Herb. Univ. Minn.).

MINNEAPOLIS, MINNESOTA.

Shorter Notes

ASPLENIUM BRADLEYI IN OHIO.—I should like to report the finding of *Asplenium Bradleyi* D. C. Eaton in Washington County, Ohio, on October 22, 1940. This is, I think, the first record for Ohio. A number of well-developed plants were found growing at the base and in the crevices of a sandstone cliff about 200 yards west of a small natural bridge and overlooking Burnett Run to the west, in Fairfield Township. A specimen has been placed in the Marietta College Herbarium.—GEORGE R. PROCTOR, *Marietta, Ohio.*

NEW LOCALITIES FOR BOTRYCHIUM MATRICARIAEFOLIUM IN MARYLAND.—During the early part of July, 1939, while searching for *Ophioglossum vulgatum*, a single plant of some *Botrychium* was found in brushy woods about thirty feet from a large salt marsh on the south side of the northern branch of the West River which empties into the Chesapeake Bay below Mayo. Subsequently, Dr. Maxon identified it as *B. matricariaefolium* A. Braun. This year the locality was revisited and about a quarter of a mile away in damp open woods about seventy small plants were found. In company with Miss Antoinette Ketner, I collected five more plants about six miles below Sykesville in damp woods along a stream near the Patapsco River.

Another locality, probably the southernmost, was found along the Patuxent River near Marlboro while searching for freak specimens of *Ophioglossum vulgatum.* Only one plant was found. Evidently this species has a wide range in Maryland and persistent searching (meaning on hands and knees) may show it to occur in numerous other localities in this the southernmost state of its range.—W. HERBERT WAGNER, JR., *Washington, D. C.*

FERNS IN THE NEWS.—Quoting from the New York Times, Science and Discovery (October 1940) carries a story of a commercial development involving ferns. The title, "War Brings Work to Jersey 'Miners,'" notes that the loss of German supplies of peat moss has led to the reopening of bogs in several areas in New Jersey. Two sites are specifically mentioned, the Troy Meadows, well known as a field station for birds and swamp plants, and Bear Swamp, in Sussex County. At the Bear Swamp site, it is said that "the miners are forced to carry twenty-five pound bags through snake-infested swamps to reach the highways, usually two or three miles away. High boots or leggings are worn as protection against copperheads." Bear Swamp, I learn by enquiry of Mr. Frank Stoll, is near Lake Owosso, at the edge of the Kittatinnys. Sounds like a good place for a Fern Society field trip in 1941. Any takers?

The article goes on to say that the peat moss (so-called) "is formed from the decomposition of the root of the *Osmunda* fern." The sites are referred to as "deposits," but from the whole text it is obvious that what is meant is neither moss, nor peat, nor a deposit. The material is actually derived from the living, wiry, black root-masses of *Osmunda spectabilis* or *O. cinnamomea.* "The chunks are cut into small pieces and the white center, known as the core, is removed. This core,

tossed back into the swamp, within ten or fifteen years is all ready to be harvested again." Can anyone substantiate this last statement from actual test?

The incorrect use of the term "peat moss" in this article, as rather widely in the florist trade, is an example of the way in which common names are sometimes badly confused and misapplied. Because of this confusion, a brief glossary may not be out of order:

(1) Botanically, living plants, or material derived from plants, of the moss genus *Sphagnum*. In the last war, specially prepared, dried *Sphagnum* was used as a substitute for absorbent cotton; it has very high absorbent qualities. In horticulture bales of the dried moss are sold as an ingredient to mix with heavy soils.

(2) A brownish, much decomposed mixture of bog-plant material, sold in bags; widely used horticulturally to lighten soils and give water-retaining quality. Allied to this, presumably, is the "peat" which constitutes a low grade fuel in many parts of the world.

(3) Mistakenly, dried root masses of *Osmunda*, as in the Times article. This material is sold in bags, and is used for the special cultural conditions required by many tropical greenhouse plants, especially orchids, bromeliads, and other epiphytes. Chunks of these wiry, tangled roots are cut into appropriate sizes and shapes and wired to supports or packed into pots. The fleshy "air" roots of the epiphytes find here a basis of support and sufficient moisture for their needs. Many tropical ferns that cannot be grown in ordinary soil will thrive when potted in *Osmunda* root material. Incidentally, chunks of this make an excellent culture base for germinating many kinds of fern spores.—R. C. BENEDICT.

Recent Fern Literature

"The Ferns and Fern Allies of Wisconsin," recently published under the auspices of the state university, is a happy example of cooperative effort. Most of the text and the photographs of herbarium specimens are by R. M. Tryon, Jr.; D. W. Dunlop has contributed the drawings and assisted in preparing the account of the fern allies; M. E. Diemer made the photographs of ferns in their native habitats; and Prof. N. C. Fassett exercised general supervision and saw the work through the press. The final result is one of the best of recent fern floras.

The book is planned and worked out with evident care and a keen eye to its maximum usefulness. It has, of course, the explanatory and physiographic introduction (both brief and informative), descriptions, keys to genera and species under each genus, glossary, and bibliography usual in well-equipped modern floras, and the maps of distribution within the state which are becoming usual. It has also a general key to all species of true ferns included, based chiefly on vegetative characters and accompanied by drawings and photographs designed to make obvious to the eye the meaning of descriptive terms used—such as "glands," not always intelligible to the inexperienced—and specifically referred to in the body of the key. For instance:

1. Blade simple or lobed less than one-third of the way to the rachis (Figs. 2–4) .....
1. Blade pinnate or lobed over two-thirds of the way to the rachis (Fig. 5) .....

This is a good device, especially as the drawings are excellent in technique and bring out with admirable clarity the characters they are intended to define.

Wherever the necessary material is available, each species is illustrated on an unusually comprehensive

scheme—a photograph of growing plants in the wild, one of an herbarium specimen of a single individual or frond, one of some enlarged and significant detail, and, where needed, drawings of parts too small or too difficult for the camera.

Partly at Mr. Tryon's request, the few minor errors discovered are here listed, by way of correction for the benefit of users of the book. On page v of the preface, "1938–39" should read "1937–38." On p. 8, the title of the key should read "chiefly based on sterile fronds." On p. 43, the dot in Ashland County on map 15 (*Polystichum Braunii* var. *Purshii*) is not accounted for in the text; Mr. Tryon informs me the map is correct. There seems to be some confusion among the illustrations of the lady ferns; figure 71 looks more like *Athyrium angustum* var. *elatius* than var. *rubellum*, as labelled, and the pinnules illustrated are hardly characteristic. The captions of maps 75 and 76 have been interchanged. And, finally, on p. 119 the author citation for *Equisetum variegatum* should be "Schleich.," not "Schleid."

The preface informs us that publication of the book was made possible by financial aid from Mr. Martin J. Gillen. Fern-lovers may well be grateful to him.[1]—C. A. WEATHERBY.

The American Fern Society is honored to number among its members the distinguished Chilean botanist, Gualterio Looser, of Santiago. Although Dr. Looser's work covers a wide range of plants, not a few of his papers treat of ferns of Chile and of South America generally. Among six articles published in 1940, three are concerned entirely with ferns. One of the species considered, *Pellaea ternifolia*, as it happens had been

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[1] Ferns and Fern Allies of Wisconsin. Madison, May, 1940. Cloth, pp. vi + 158, 214 figs., 76 maps.

first described by a Spanish botanist of nearly a century and half ago, Cavanilles. For purposes of record, the articles are listed below.[1] With the knowledge that the Spanish word for ferns is "helechos," it is easy to translate the titles of the fern papers.

From a survey of the articles one is impressed with the realization that Chilean climate and soil conditions must, in part, at least, have much in common with those of the United States. In the paper entitled "Botanical Miscellany V." (Botanica Miscelanea V), the growth and appearance of our eastern cypress, *Taxodium distichum*, which has been planted in Chile as an ornamental, are discussed. In appropriate situations, the cypress develops the characteristic aerating "knees" so familiar in the United States. Two weeds of our eastern states have also found their way to Chile, whether directly from the Old World or by way of North America is not stated—*Arctium Lappa* and *Echium vulgare*. Another newcomer, *Lupinus arboreus*, hails from California.

Among a considerable number of ferns discussed in three of the articles, the following species will be familiar to fern students of the United States: *Cryptogramma crispa*, *Polypodium polypodioides*, *Botrychium Lunaria*, *Cystopteris fragilis*, and *Polystichum mohrioides*. A complete list of Southern Andean ferns would present

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[1] Sobre algunos Helechos de los Andes de las Provincias de Curico y Talca. Revista Universitaria **25**: 79–82. 1940.

Las Localidades de los Tipos de los Helechos Chilenos. Revista Universitaria **25**: 155–204. 1940.

Sobre el Helecho *Pellaea ternifolia* en Chile y Generalidades sobre esta Genero. Revista Universitaria **25**: 109–116. 1940.

Botanica Miscelanea V. Revista Universitaria **25**: 31–34. 1940.

Las Fechas de Publicacion de las "Plantas Nuevas Chilenas" de Rudolfo Amando Philippi. Revista Argentina de Agronomia **7**: 144–150. 1940.

Chamisso, Adalberto de. Mi Visita a Chile en 1816. (Translated by Gualterio Looser, with a "Nota sobre la Vida y Obras de Chamisso".) Rev. Chil. Hist. Geogr. **88**: 1–50. 1940.

a considerably larger number of species found also in our northern region. Those interested in fern gardens will wonder how many distinctively Chilean species might be happy in company with our local hardy species. That American fern students as well as ferns are not unknown in Chile is indicated by the listing of a South American maidenhair, *Adiantum Weatherbyanum* Espinosa. We hope it is a handsome species.—R. C. BENEDICT.

A 22-page key to the species and subspecies or varieties of pteridophytes now recognized as growing in the Gray's Manual range has recently been published.[1] It is arranged on the index-number plan, and is dichotomous except at numbers 5, 23, 42, 72, 90, 106, 110, 120, 166, and 176. It appears to be complete except for the omission of *Isoetes virginica;* the nomenclature follows Broun's Index, although there are some 10 misprints in the spelling of technical names. One new name is published, on page 154; the plant described by Miss Braun[2] as *Asplenium cryptolepis* × *Camptosorus rhizophyllus* becomes × *Asplenosorus inexpectatus* Braun ex Friesner.

Unfortunately the key contains several wrong "leads." Thus, second entry 42, "Fertile segment merely the contracted terminal portion . . . ," leads to 43, *Polystichum braunii* var. *purshii*, one of the diagnostic characters of which is that the terminal portion is *not* contracted. Second entry 78, "Fronds pubescent or hirsute," leads to 79, *Cheilanthes siliquosa*, which is *glabrous*. Second entry 101, "Rachis black," includes, at 103, *Asplenium platyneuron*, in which this structure is brown. And so on.

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[1] Friesner, Ray C. Key to Species and Varieties of Ferns and Fern-allies of Northeastern North America. Butler Univ. Botan. Stud. 4: 141. August, 1940. (Reprints for sale at ten cents per copy by the Department of Botany, Butler University, Indianapolis, Indiana.)

[2] This JOURNAL, 29: 133. 1939.

An error that has led to numerous false reports of *Dryopteris simulata* is unfortunately repeated here: 136, "Fruiting veins simple," versus "Fruiting veins once-forked" for *Dryopteris thelypteris*. Actually it is only the *sterile* veins which can safely be used for this differentiation.

Aside from such obvious errors, the key does not allow sufficiently for variation and intergradation between species, especially in the more difficult groups—*Botrychium, Phegopteris, Asplenium* hybrids, *Cystopteris fragilis* varieties, *Woodsia, Equisetum,* and *Isoetes.* Thus, unbranched forms of *Equisetum fluviatile* and *E. palustre,* which are not rare, will come out in the key to *E. kansanum;* whereas small shoots of *E. fluviatile,* which may have rather loose sheaths with 8 teeth or even fewer, will run to *E. palustre.* The key under discussion evidently needs extensive revision to make it more nearly "fool-proof."—E. T. WHERRY.

Perhaps the most extraordinary scientific publication which has ever been noticed in the FERN JOURNAL is the periodical "Natura," the first number of which has just been brought to our attention. It is published, in Japanese and Portuguese, by the Kanihara Institute of Natural Science of Brazil, located at São Paulo in that country.

It is probably news to most of our readers that there are enough Japanese in Brazil to support a scientific institution of their own. It is also news that there are enough species of plants common to both countries to suggest a "Flora Nippo-Brasiliensis." However, the first installment of such a flora, by Goro Hashimoto and covering the ferns, appears in this number of Natura. By dint of stretching specific limits very widely ("*Botrychium virginianum,*" for instance, of southern Brazil would be referred by nearly all present-day pteridolo-

gists to *B. cicutarium*) and of including all species in cultivation, even when not native to either country, the author, with some mishaps in the way of misprints and transpositions of captions, has achieved a list of 18 species which the enquirer might find both in Japan and Brazil.[1]

The present reviewer is handicapped in dealing with Natura by an exceedingly limited knowledge of one of the two languages used in it and none at all of the other; but, with the aid of a better equipped colleague, he makes out, from a preface by the Japanese consul at São Paulo, that the object of the publication is to stimulate scientific activity among the Japanese immigrants, to make known Japanese theories and discoveries, and thereby to aid Brazil on its upward cultural path. He confesses to some doubt as to the usefulness, for this purpose, of the Flora Nippo-Brasiliensis.—C. A. WEATHERBY.

American Fern Society

Report of the President for 1940

The AMERICAN FERN JOURNAL is the greatest benefit that members derive from their affiliation with the Society. After a long period of devoted service, Mr. C. A. Weatherby, Senior Editor, felt it necessary to retire from that position at the close of the year. His resignation was regretfully accepted, and to succeed him as Editor-in-chief the Council voted the appointment of Dr. William R. Maxon, to be assisted by a board composed of three other members: Dr. R. C. Benedict, Mr. C. V. Morton, and Dr. Ira L. Wiggins.

Through the maintenance of free mediums of expression, science can survive and progress. Scientific journals differ from those of other types in that they must ac-

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[1] Hashimoto, Goro. Flora Nippo-Brasiliensis, I. Natura 1: 11–25, 6 figs. 1940.

cept for publication all honest and carefully prepared reports on research, so long as they are within the field of the journal concerned and not beyond its financial ability for publication. Editors cannot refuse articles for political reasons or because the material presented is contrary to their own point of view. Yet, in order to insure a high-quality publication, editors must insist that manuscripts be prepared with rigorous care, that facts and ideas be clearly expressed in as few words as possible and that, before writing, each author examine thoroughly the previous literature in order to avoid needless duplication of information. Details of nomenclature and taxonomy are affairs beyond the editorial sphere. For that reason, writers must be even more careful in these matters. A great responsibility rests on their practices.

After the JOURNAL, the Society's library and herbarium are perhaps next in importance. In 1940, Dean L. S. Hopkins, after many years as Curator, ended his service in that capacity. The Herbarium, by order of the Council, was moved to the Brooklyn Botanic Garden, where it is now housed. Members wishing to borrow or contribute specimens should correspond with Miss Hester M. Rusk, the Society's Librarian, who will serve also as Curator of the Herbarium.

In the election at the end of 1940, various amendments to the Constitution were placed before us for vote. These proposed changes raise the whole question of our method of obtaining persons for the various offices. To achieve this end, there may be better ways than the one which we now use. For example, we might have nominations from the entire membership. A nomination blank might be sent to each member about September 1. On this he might indicate one name for each office. These blanks

might then be sent to a Judge of Elections who would count the nominations. Names of the three highest nominees for each office might then be forwarded to the Secretary who could have the ballots printed as before. Such procedure would abolish completely the nominating committee and would give every member a chance to express his preference. In order to prevent too rapid changes in the two vital offices, those of Secretary and Treasurer, it might be fixed that these offices are filled for terms of five or even ten years. I should greatly like to see some such proposal, perhaps the above suggestion or some modification of that, presented as an amendment, with the necessary number of signatures as required by our Constitution, and then submitted on a ballot for a general vote.

In conclusion, I wish to express appreciation to both Mr. C. A. Weatherby and Dean L. S. Hopkins for their great contributions in service to the Society.

ROBERT T. CLAUSEN, *President*

Report of the Secretary for 1940

The Fern Society started off promptly in 1940 for an active year, beginning with a two-day field meeting in Florida under the leadership of Mrs. W. D. Diddell of Jacksonville. I feel sure that the report of this meeting, which appeared in No. 2 of the JOURNAL for 1940, must have aroused keen desires in the Society's members to see those unusual areas and their fern flora. No summer field meeting was held, but at the regular annual meeting held in conjunction with the Convocation of the American Association for the Advancement of Science in Philadelphia during the Christmas holidays, a full program was presented to an enthusiastic group of members and their friends. A report of this meeting will be found elsewhere in the JOURNAL.

Among the losses in membership during the year were four members of long standing who were taken by death, each of whom had been a member for more than twenty-five years—Dr. David M. Mottier, Prof. Fermen L. Pickett, Dr. Walter Mendelson, and Mr. George S. Humphrey. The year also brought an uncommonly large number of new members—thirty-three—bringing the total membership to an all-time record number of three hundred sixty-two.

The results of the annual balloting are to be found elsewhere in the JOURNAL. Due to delay in receiving the list of nominations, the ballots were later than they should have been in getting to the members, and the time allowed for returning the votes to the Judge of Elections had to be cut correspondingly. This may have been, in part, the reason for the return of so small a number as seventy-eight out of the three hundred sixty ballots sent out. We hope it does not indicate a slackening of interest in the affairs of the Society, for it is only by the continued interest and support of all the members that the Society can continue to grow and to increase its usefulness in a more complete understanding of the fern world. The Secretary would be glad to hear from any member who has suggestions as to activities or plans he would like to see the Society undertake.

The JOURNAL has now completed thirty volumes, and it may not be amiss to remind the members that if any one lacks back numbers to complete his files, the Treasurer will be glad to arrange to fill such needs. To new members attention is called to the twenty-five year Cumulative Index—a most helpful guide to a fund of fern information stored in the first twenty-five volumes of the JOURNAL.

ELSIE GIBSON WHITNEY, *Secretary.*

Report of the Treasurer for 1940

Receipts

Cash on hand Jan. 1, 1940			$ 337.49
1938 Membership Arrears	$ 4.50	$ 4.50	
1939 Membership Arrears	39.50	39.50	
1940 New Members	36.00		
1940 Membership Renewals	391.53	427.53	
1941 New Members	12.00		
1941 Membership Renewals	25.50	37.50	
1942 Membership Renewals	3.00	3.00	
1939 Subscription Arrears	6.25	6.25	
1940 New Subscribers	10.10		
1940 Subscription Renewals	81.70	91.80	
1941 New Subscribers	10.10		
1941 Subscription Renewals	39.71	49.81	
Life Membership	25.00	25.00	
Sale of back numbers A. F. J.	190.44	190.44	
Sale of Hart's Tongue Fern	.65	.65	
Sale of A. F. J. Index, Vols. 1 to 25, incl.	1.00	1.00	
Gifts (cash)	78.57	78.57	
Gifts (books) A. F. J. back numbers	13.27	13.27	
Author's corrections, 25-year Index	17.75	17.75	
1940 Advertising—Cambosco	4.00	4.00	
Reprints	12.14	12.14	1,002.71
			$1,340.20
Deduction a/c Life Membership[a]	$ 25.00		
" Emergency Fund, back numbers[b]	82.58	107.58	
			$1,232.62

Disbursements

Science Press		
A. F. J. Cumulative Index, Vols. 1 to 25, incl.	$352.30	$352.30
A. F. J. Vol. 29, No. 4	144.44	
A. F. J. Vol. 30, No. 1	132.49	
A. F. J. Vol. 30, No. 2	112.41	
A. F. J. Vol. 30, No. 3	114.60	503.94
Reprints	16.31	16.31
1,000 printed clasp envelopes	10.96	10.96
Trade Discount	16.16	16.16

Agency Commission	9.04	9.04	
Bank Charges	1.26	1.26	
Gifts (books) transferred to Inventory A. F. J.	13.27	13.27	
Express, transferring A. F. S. herbarium to Brooklyn	16.66	16.66	
Expense Treasurer	28.05	28.05	
Expense Secretary	15.25	15.25	
Expense Librarian	.15	.15	983.35
			$ 249.27
Less postage stamps on hand 12/31/40			4.04
			$ 245.23

[a] Transferred to a separate account.
[b] Profit on sales A. F. J., transferred to a separate account.

Statement Dec. 31, 1940

Assets			*Liabilities*	
Cash on hand	$245.23		Capital a/c	$5,000.39
Cash in closed bank	7.05		1941 Memb. Susp. a/c	37.50
In Spec. a/c #1	530.79		1942 Memb. Susp. a/c	3.00
In Spec. a/c #2	51.67		1941 Subscr. Susp. a/c	49.81
In Spec. a/c #3	82.58	$ 917.32	Distributing Vol. 30, No. 4, to Memb. & Subscr. Susp. a/c	99.00
Postage stamps		4.04	Bissell Herb. Fund	530.79
Accts. Receivable		31.65	Life Memb. Fund	51.67
Notes Receivable		3,200.00	Emergency Reserve Fund, Back Numbers	82.58
Inventory A. F. J.		1,451.73		
A. F. S. Library (books)		250.00		
		$5,854.74		$5,854.74

HENRY K. SVENSON, *Treasurer*

We have examined the accounts of the treasurer of the American Fern Society for 1940 and found them correct.

Arthur H. Graves
Hester M. Rusk
Auditing Committee

March 1, 1941

Report of the Judge of Elections

Mrs. Elsie C. Whitney
Secretary, American Fern Society
Dear Mrs. Whitney:

The results of the annual election of the American Fern Society are given herewith.

Seventy-eight ballots were returned. Due to an oversight in the make-up of the ballot many members failed to vote at all on the first amendment; one negative vote was received. A tabulation of the votes cast for the officers and the affirmative votes cast for the amendments follows:

For President
Dr. Robert T. Clausen 77
For Vice-President
Mr. Joseph Ewan 76
For Secretary
Mrs. Elsie G. Whitney 77
For Treasurer
Dr. Henry K. Svenson 76

First Amendment 41
Second Amendment 74
Third Amendment 75
Fourth Amendment 75
Fifth Amendment 74
Sixth Amendment 75

As Judge of Elections I declare the above officers duly elected, and the amendments adopted.

Respectfully submitted,

W. L. DIX, *Judge of Elections.*

EDITORIAL REPORT, 1915–1940.—With the last number of the JOURNAL, my connection with it as editor ceased. There is just one adequate excuse for my taking space to talk about this event; it would be ungracious indeed

if I withdrew without a word—this word—of appreciation of my good friends and associates—fellow editors, officers of the Fern Society, my wife, who has made many indices, the printers, and, not least, the contributors—whose unfailing friendliness, cordial support, and patience with my short-comings have made my quarter-century with the JOURNAL the pleasant experience it has been.

When I joined the staff in 1915, the JOURNAL was beginning its fifth year and well past the experimental stage. Its capable founders had set it firmly on its feet. There has been no major change of policy since, and no need of any. We have tried to avoid becoming wholly technical or wholly "popular," and to supply something of interest to all the rather varied elements which make up the Fern Society. In so far as we have succeeded, that is only in small part the editors' doing—this editor's, at any rate. It is, rather, the contributors who have made the JOURNAL.

The wonder is that in so restricted a field so much of interest could be produced. But it has been; the stream of copy has flowed in steadily, only now and then running low. Very little of it has required drastic revision; very, very little has had to be rejected. There is no reason in the nature of things why the stream should not go on indefinitely. There is much still to be learned about ferns, much knowledge which can be garnered by anyone who has a corner where plants can be grown and watched, or who will make and record repeated observations in the wild. Amateurs in ferns can greatly aid the professional botanist, as the lay observers of variable stars are helping the professional astronomers; and the JOURNAL and science will profit. I like to think that they will, and that future editors can look forward to a flow of matter even more bountiful and stronger and better than that of my time.—C. A. WEATHERBY.

THE PHILADELPHIA MEETING.—The American Fern Society held its annual meeting in Philadelphia on January 1, 1941, as an associated society of section G of the American Association for the Advancement of Science. About 30 members and friends of the Society were in attendance. The formal program consisted of several papers presented by members.

Dr. Ewan spoke on "Sources of the Fern Flora of Colorado." The 56 pteridophytes known from the state have been derived from seven sources. The Holarctic or Circumboreal element is the most important and is represented, for example, by *Cryptogramma crispa* var. *acrostichoides*. Other species represent Pacific Coast, Rocky Mountain, Southwestern, Southeastern or Appalachian floras. A group of "Stratospheric" species are virtually waifs, whose spores have been transported great distances by the upper currents of the air. *Asplenium Adiantum-nigrum* and *Adiantum Capillus-veneris* were cited as examples of this group.

Dr. Wherry talked on "Recent Pennsylvania Fern Finds" and illustrated his remarks with slides of specimens, habitat views, and maps. He commented upon hybrid Aspleniums, and variations in the *Dryopteris spinulosa* complex, in various lycopods, and in *Cystopteris fragilis*. During the discussion of the paper Mr. Dix told of some Spinulose Wood-fern and *Botrychium* variations he had found. Mr. Weatherby commented on the actual identity of *D. spinulosa* var. *fructuosa* (with the leaf-cutting of typical *spinulosa* but glandular as in var. *intermedia*), and said that much of the present confusion in regard to this variety is due to an attempt to enlarge the concept to include much material that does not resemble the type specimen.

President Clausen illustrated his paper on "Experiences with Ferns in the Western United States" with

scenery and habitat slides. He told of finding many of the rare and interesting western species, especially *Botrychium pumicola* at Crater Lake, the type locality. He emphasized also the striking differences in habitat preferences between species in the eastern and western parts of their range and between western species and varieties and closely related eastern ones.

Mr. Weatherby discussed an unusual specimen of ×*Asplenosorus ebenoides*, collected in the wild, that had the pinnae long-attenuate and some of them rooting at the tip.

Mr. Tryon spoke on "Fern Collecting in Wisconsin" and illustrated his talk with herbarium specimens. Interesting forms, habitat, and ecological data were discussed.

Dr. Benedict spoke on the history of the American Fern Society, the Fern Bulletin, and the American Fern Journal, and gave interesting reminiscences of the early days of the Society. He also spoke of Mr. Weatherby's invaluable contributions to the Society, especially as editor of the JOURNAL for the past 26 years.

At the close of the formal program President Clausen, on behalf of the Society, presented Mr. Weatherby with a scroll in recognition of his long and greatly appreciated service. He announced also that the Herbarium of the Society had been moved to the Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, N. Y. The meeting was then adjourned to another room for informal discussion and examination of interesting specimens brought by many of the members. It proved one of the most successful in recent years.

The following papers on ferns were presented at meetings of other societies: H. N. Andrews, Jr., "The Ferns of the Frontier Formation of Southwestern Wyoming"; R. M. Tryon, Jr., "A new *Dryopteris* Hybrid (*D. frag-*

rans var. *remotiuscula* × *spinulosa* var. *intermedia*)"; H. L. Weaver, "Bilateral Prothallia of *Cryptogramma acrostichoides* R.Br."; and M. A. Chrysler, "On the Structure and Development of *Ophioglossum palmatum*."

R. M. TRYON, JR., for the *Secretary*.

LESTER PAIGE BRECKENRIDGE.—Twenty-five years ago, L. P. Breckenridge, professor of mechanical engineering at Yale University, became interested in the study of ferns, and joined the American Fern Society. Not many years thereafter, when he retired from active service at Yale, this fern interest had become the source of a great deal of activity and pleasure. Probably he was attracted first to these plants by the relative richness of the fern flora of Vermont, where he had a summer home. Later he pursued this interest during trips to various parts of the world and, indeed, picked his routes and stopping places, to some extent, on the possibilities of fern collecting. At one time he wrote from Italy of finding Hart's-tongue in the limestone of the Dolomites, and forwarded pressed specimens. In another letter he told of a forthcoming trip to China, during which he was looking forward to making the acquaintance of some of the Chinese species.

In a recent issue of Science, the death of Professor Breckenridge, at the age of 82, was recorded. With sincere regret for his passing, the Fern Society may nonetheless rejoice in the privilege of the association which the Society and its JOURNAL make possible. We are a friendly community of many people from very diverse walks of life, united in our enjoyment of the study of an exceedingly interesting group of plants.—R. C. B.

Dr. Benedict's review of the history and varied activities of the Society, mentioned in Mr. Tryon's report of

the Philadelphia Meeting (p. 37), will appear in the next number of the JOURNAL under the title, "The American Fern Society through Thirty Years." It is an interesting summary of steady growth and of increasing usefulness. His suggestion of a definite program to make the Society and the JOURNAL more widely known has resulted in the appointment of a special committee on increase of membership. Similar programs of expansion having been carried out recently by other scientific and natural history organizations, the committee is sanguine of success and will outline its plans shortly, asking the hearty cooperation of all members. So far as our main activity —the JOURNAL—is concerned, the gain would be very great, for there is at present no dearth of "copy" and only a larger income is needed to place interesting subject matter in the hands of an increasing number of members. A vigorous campaign, with wide distribution of new circulars outlining the work of the Society, is planned.—W. R. M.

New members:

Allen, Miss Mary N., 6 Academy St., Worcester, Mass.
Brown, Prof. V. E., Taylor University, Upland, Illinois.
Ferril, Mrs. W. C., 2123 Downing St., Denver, Colorado.
Griesel, Mr. Wesley O., 3465 Rosemary Ave., Glendale, Calif.
Kligman, Mr. Albert M., 1596 No. 52d St., Philadelphia, Pa.
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Changes of address:

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Vol. 31 April-May, 1941 No. 2

American Fern Journal

A QUARTERLY DEVOTED TO FERNS

Published by the

AMERICAN FERN SOCIETY

EDITORS

WILLIAM R. MAXON

R. C. BENEDICT C. V. MORTON

IRA L. WIGGINS

CONTENTS

The American Fern Journal Through Thirty Years
R. C. BENEDICT 41

New Stations for Florida Pteridophytes
MARY W. DIDDELL 48

New Lycopodium Gametophytes from New Jersey
HOLLIS KOSTER 53

Lawson's Type Specimens ..... C. A. WEATHERBY 59

Some Noteworthy Fern Communities of Arkansas
DWIGHT M. MOORE 63

Shorter Notes 71

Recent Fern Literature 75

American Fern Society 77

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American Fern Journal

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A regular loan department is maintained in connection with the Society herbarium. Members may borrow specimens from it at any time, the borrower paying all postal or express charges. The pages of the Journal are also open to members who wish to arrange exchanges; a membership list is published to further assist those interested in obtaining specimens from different localities.

American Fern Journal

VOL. 31 APRIL–JUNE, 1941 NO. 2

The American Fern Journal Through Thirty Years

R. C. BENEDICT

"Even if it had contained no contributions of value, it would still have been worth while, for it helped members to form friendships through correspondence if not by actual acquaintance. It was a place where those who needed help could make known their difficulties and feel pretty sure that someone could help them." So wrote Dr. C. E. Waters of the Fern Bulletin in a reminiscent article published in the eleventh volume of the JOURNAL. He was recalling the very beginning of the American Fern Society in 1893 when some nineteen fern-lovers banded together as the Linnaean Fern Chapter of the Agassiz Association. At the start they had planned to keep in touch with each other by correspondence, but the difficulties of that procedure led to the issuance of the first number of the "Fern Bulletin" as a little leaflet which sold for five cents. This was designed to take the place of letters, and to serve as a medium for the exchange of experiences in fern-hunting, and for the posing of questions and their answers for all to read. It may be noted that it was in the same spirit, nearly twenty years later, that the first numbers of the AMERICAN FERN JOURNAL were issued as a cooperative venture by some half dozen members, with a view to finding out whether the Fern Society, then grown

[Volume 31, No. 1 of the JOURNAL, pages 1–40, was issued April 4, 1941.]

to about two hundred members, was ready to undertake the issuance of a periodical of its own.

Referring again to the beginnings and earliest years of the Fern Society, the success of the Society and of the Fern Bulletin went hand in hand. It fell to the lot of one of the original members, Willard N. Clute, to take over the Fern Bulletin for the Society, and to carry it on through twenty volumes. That this Bulletin served admirably the initial purposes of the founders of the Fern Society is evidenced by the steady increase in the number of members by over nine hundred per cent in less than twenty years. The value of Professor Clute's contributions to the Fern Society, in its organization, through his stimulating leadership, through the Fern Bulletin, and through his valued fern books, can not be overestimated.

In addition to the Fern Bulletin, the Society continued to forward its primary purpose of bringing members into acquaintance and correspondence. Local field meetings, annual meetings, the distribution of sets of herbarium specimens, and the recurrent publication of membership lists were and have remained a feature throughout the years. Through the membership lists, and through news notes in the Fern Bulletin, members were able to establish contacts by correspondence or by visits to those nearby. Experiences were exchanged, as well as more material things like herbarium specimens, and living plants for fern gardens. The growing of ferns was undoubtedly a favorite pursuit of members from the very start, but probably at first a larger number was concerned with collecting fern leaves as herbarium specimens.

Appropriately, therefore, a Society Fern Herbarium was established at an early date, with a Curator, Alvah A. Eaton, whose task was the maintenance of the collection and also the lending of specimens to members who wished to make comparisons. At first the Fern Bulletin and, for

the last thirty-odd years, the American Fern Journal have been the media through which the growth of the Herbarium and its use by members have been reported. It is fitting to record here that in 1940 the second Curator of the Herbarium, Prof. L. S. Hopkins, completed over thirty-one years of service in this office. That, I am sure, is the longest continuous service to the Fern Society of any officer since the start of the original chapter in 1892.

To continue and maintain the tradition of membership activity in connection with fern study, the American Fern Journal was launched in 1910 in the form of two preliminary sixteen-page numbers, privately financed by a small number of members. At the start of 1911, the Executive Council adopted the new journal as its official periodical and incorporated the two experimental issues of 1910 with the four numbers of 1911 into Volume I of the American Fern Journal. Of that beginning, E. J. Winslow, writing about ten years later, expressed the following: "The event seems to have justified the venture. During the year 1911, the growth in membership exceeded that of any other year in the history of the Society." Now at the start of 1941, we can record a total of over 4200 pages published in the regular quarterly issues of the JOURNAL, with additional pages in the form of annual tables of contents, membership lists, and just recently, Dr. Wherry's valued 88-page Index of the first twenty-five volumes, to make a grand total of over 4500 pages. A table giving the yearly number of pages and illustrations is appended at the end of this article.

That the JOURNAL has continued to serve the interests of the Society as a means of interesting new members and encouraging the friendly interchange of experiences is attested by the continued growth of the membership, as well as by the news and other contents of the JOURNAL.

An approximate record of the growth of the Society is afforded by the following figures, taken in part from membership lists and from text references and official statistics.

GROWTH OF THE AMERICAN FERN SOCIETY: MEMBERSHIP FIGURES

1892	19	1920	264
1900	100	1924	300
1910	200	1938	332
1915	250	1940	365 (Dec. 31)

Figures for the number of subscribers other than members have shown a similarly gratifying upward trend. In 1915 such subscriptions numbered 44; at the close of 1940, the figure had risen to 113, with 31 individual American subscribers, 18 from foreign countries, and 64 representing local institutions like libraries, colleges, etc. The past year has been one of the best, so far as new members are concerned. A considerable accession has been taking place, without any organized effort on the part of the Society. It is suggested that with thirty years of the JOURNAL completed, and with the fiftieth anniversary of the Fern Society now almost upon us, a definite program to make the Society and JOURNAL more widely known might well be undertaken. During the past year or two the Torrey Botanical Club has carried out such a program with remarkable success—a gain of over thirty per cent in the number of members. If the Fern Society could achieve anything approximating this result, the JOURNAL could immediately increase its service and value to the members, thus, in turn, promoting further growth. Instead of showing a mere seventy page average increase per decade as in the past, it might well exceed that rate of increase per year in its second thirty years.

Even with the untoward conditions of this year and period, there are not a few reasons why the Fern Society may hope considerably to extend its membership and influence. Its program, while restricted in scope, is in line with general developments in the field of natural history,

gardening, and the out-of-doors. Its present membership is a cross-section of nature-lovers; the professional botanists are far outnumbered by the nonprofessional among its members—doctors, dentists, engineers, football coaches, business men, ministers, chemists, zoologists, gardeners, and a host of others. Its membership dues are modest. The articles published in the JOURNAL have a wide range of appeal—gardening, spore culture, conservation, fern collecting, state and local fern lists, and a sufficient number of more technical papers—offering varied reading matter for our membership.

Probably nearly all members are aware of the policy which has been followed of maintaining complete sets of back numbers of the JOURNAL. This has required in the past, as it will in the future, the occasional reprinting of earlier issues whenever their stock becomes exhausted. That this has been a constructive policy, there can be little doubt. It was started with the deliberate purpose of making the early volumes available to new members. These earlier issues are not merely of historical value; they are replete with significant, interesting, and timely observations regarding native and other ferns. More than once I have thought I had hatched out something new or made a new observation, only to discover that it had long before been announced in the pages of the American Fern Journal or the Fern Bulletin. From the standpoint also of new library subscriptions, the possibility of obtaining a complete file of the JOURNAL, *at no advance over publication price*, is an important selling argument.

New members are not required, however, to purchase complete files in order to have a chance to consult the earlier issues of the JOURNAL. In line with the policy by which herbarium specimens are lent for study, the Fern Society established in 1930 a library loan service and thus made available sets of the JOURNAL, the Fern Bulletin, and a selected number of fern books and reprints. These are

kept and cared for in the Library of the Brooklyn Botanic Garden, with Miss Hester Rusk, of that institution, serving as Librarian for the Fern Society. Members may borrow any of the items of the Fern Society Library by application to Miss Rusk and payment of packing and shipment charges. Besides the library of the Fern Society, the Brooklyn Botanic Garden will lend from its much larger collection of fern books on almost as free and easy a basis. A special list of books etc. available was published in vol. 21 of the JOURNAL, pp. 34–38 (1931).[1]

Since the present article is by way of being a survey of the first thirty years of the American Fern Journal, a brief mention of the succession of members of the editorial staff may be included. For the first two experimental issues, published in 1910, E. J. Winslow handled the business affairs; R. C. Benedict the manuscripts and proof-reading. During 1911 and 1912, Philip Dowell took over the editorial work, with Messrs. Winslow and Benedict associated. During 1913 and 1914, the latter two were in charge. Beginning in 1915, C. A. Weatherby served in an editorial capacity, with increasing responsibility, until before long he was really chief of staff. For the twenty-six years of his service, his careful scholarly work proved of inestimable value to the JOURNAL and to the Society. Mr. Winslow carried on for twenty-five years details of business management, involving much correspondence and drudgery. In 1934, W. R. Maxon joined the editorial staff, and with 1941, with C. V. Morton and Ira L. Wiggins as new assistant editors, Dr. Maxon has taken charge of the thirty-first volume of the JOURNAL as editor-in-chief, the writer also continuing to serve.

No account of the JOURNAL would be complete without

[1] Further details regarding the loan of herbarium specimens and books, the purchasing of back numbers, etc., are stated on the second cover page of the JOURNAL.

reference to the extensive contributions which the Brooklyn Botanic Garden has made to the JOURNAL and to the Fern Society. Since early in 1914, the editor who is writing this has had a research connection with this institution, involving greenhouse space for experimental ferns, library facilities and desk space for reference and JOURNAL work. Since 1926, all the back files of the JOURNAL have been housed and serviced at the Botanic Garden. Headquarters at an institution having the standing of the Brooklyn Botanic Garden is obviously beneficial in itself, while the monetary value of the shelving space and of the incidental custodial work of the Garden staff has been a considerable item. Add to these the contributions mentioned above respecting library care. And now, with 1941, a further connection with the Brooklyn Garden takes effect. The Fern Society's Herbarium has been recently transferred to Brooklyn, and Miss Hester Rusk, of the Garden staff, has consented to add to her duties as Fern Society Librarian those as Curator of the Fern Society Herbarium.

The following table is a summary of the pages and illustrations published in the American Fern Journal through thirty volumes.

1910–1920			1921–1930			1931–1940		
Volume	Pages	Illustrations	Volume	Pages	Illustrations	Volume	Pages	Illustrations
1	156	9	11	139	3	21	152	14
2	128	8	12	139	7	22	144	9
3	128	21	13	138	6	23	136	7
4	132	17	14	130	10	24	128	8
5	127	9	15	134	12	25	144	14
6	136	6	16	136	13	26	148	16
7	130	8	17	146	9	27	144	7
8	130	6	18	136	10	28	164	16
9	130	10	19	146	12	29	162	11
10	128	1	20	164	11	30	144	12
Totals	1,325	95		1,399	93		1,482	114

Thirty-year total	4,206	pages, 302 illustrations
Supplementary matter (estimated)	210	"
Cumulative Index, Vols. 1–25 (Wherry)	88	"
Grand total, about	4,500	pages, 302 illustrations

BROOKLYN BOTANIC GARDEN AND
BROOKLYN COLLEGE

New Stations for Florida Pteridophytes

MARY W. DIDDELL

In 1938 there was published in the FERN JOURNAL "A County Check-List of Florida Ferns and Fern Allies," by Donovan S. Correll. During the two years that have since elapsed I have done quite a bit of collecting, especially in the territory stretching from the St. Mary's River on the north to a point a little south of Ocala and covering portions of Nassau, Duval, Clay, St. Johns, Marion, and Levy counties. In my rambles I have located several new stations for ferns and fern allies, and have found one species entirely new to the state. The list follows.

OPHIOGLOSSUM FLORIDANUM E. St. John (referred by Dr. Clausen to *O. petiolatum* Hooker). Nassau County: Swamp two miles east of Yulee, on the Fernandina Road. Duval County: Roadside ditch bank, two miles beyond Jacksonville city limits, about one mile south of Lake City road. St. Johns County: Swamp near canal bridge, south end of Palm Valley. Not previously reported north of Alachua County.

ANEMIA ADIANTIFOLIA (L.) Sw., DRYOPTERIS AUGESCENS (Link) C. Chr., and D. REPTANS (J. F. Gmel.) C. Chr. Near Williston, Levy County, is a crater-like sink, its sheer rock sides leading down to water of great depth and wonderful sapphire-blue. There is not enough shade for any of the rock Aspleniums, but under trees around

the top rock outcroppings harbor *Anemia adiantifolia* and *Dryopteris augescens*. A break in the rock wall gives access to the water's edge, and at this point the rock face bears a profuse growth of *Anemia* and an interesting and unusual form of *D. normalis*. A short distance back in the hammock are two shallow shafts, each having its sides covered with *D. reptans* and a very few plants of *D. normalis*. None of these species except *D. normalis* has previously been found in Levy County.

LYGODIUM JAPONICUM (Thunb.) Sw. Duval County: An escape growing plentifully in a swamp within the city limits of Jacksonville. Previously reported only from western Florida. A few years ago I noticed this fern growing as an escape, in great profusion, over the grounds of the Glen St. Mary Nursery, especially through the section devoted to Azaleas; it would be interesting to know if it has spread outside the nursery.

PHLEBODIUM AUREUM (L.) R. Br. Clay County: In a deep ravine near brickyard, Middleburg Road; growing out of soft, ferrous rock; *not* epiphytic.

ASPLENIUM PUMILUM Sw. Marion County: A new station for this rare species, on rock outcroppings around the rim of a sink not far from Ocala.

DIPLAZIUM ESCULENTUM (Retz.) Sw. Dade County. I found one young plant of this Asiatic fern in Royal Palm Hammock, Royal Palm State Park. It is growing also in the gardens of Mrs. Peterson and Mrs. Lott, Miami, and there are some very fine plants of it in the nursery of Carl Cowgill, Tampa. I have never seen it anywhere else. It would be interesting to know if it has escaped on the Gulf Coast.

BLECHNUM SERRULATUM L. C. Rich. St. Johns County: Swamp, south end of Palm Valley bridge, as the crow flies, about twenty miles from Jacksonville. This is the farthest north I have ever seen this species.

DRYOPTERIS DENTATA (Forsk.) C. Chr. Duval County: Within the city limits of South Jacksonville.

DRYOPTERIS ULIGINOSA (Kunze) C. Chr. Duval County: A large colony of magnificent plants in a deep ditch in Evergreen Cemetery; since completely destroyed by WPA workers. Marion County: Twin Sinks, south end of Orange Lake. Hillsboro County: Lime-sink in Bloomingdale section, 17 miles from Tampa. Not previously reported from Duval, Hillsboro, or Marion counties.

POLYSTICHUM ACROSTICHOIDES (Michx.) Schott. Calhoun County: Appalachicola River Bluff, Torreya State Park. This is the first record from Calhoun County. However, this fern possibly has a much wider Florida distribution than is now known, as last year I saw a good specimen growing in a garden in Lake City, Columbia County. The owner of the garden said she had got it out of the woods; when pressed as to locality, she was rather vague but said it was plentiful thereabouts. I could not then search for it, and have not had opportunity to go back. This will bear investigation.

CYRTOMIUM FALCATUM (L. fil.) Presl. I found one small plant of this, growing as an escape, on a rock wall supporting a stairway leading down the steep river-bluff on the Trout estate, on the south side of the St. John's River, Duval County. It has previously been reported only from the walls of Fort Marion, St. Augustine.

PTERIS CRETICA L. [*Pycnodoria cretica* (L.) Small]. Marion County: A much laciniated and crested form, growing profusely in the deeper of the Twin Sinks, south end of Orange Lake.

SALVINIA ROTUNDIFOLIA Willd. Plentiful in most of the slow-moving tributaries of the St. John's River and in lakes, and probably over most of the state.

PSILOTUM NUDUM (L.) Griseb. Nassau County: In sand, beneath a stunted cedar (*Juniperus barbadensis*), both growing out of the top of the wall of Fort Clinch, Amelia Island. On nearby Fort George Island this species grows profusely and vigorously in leaf-mold around the bases of old Barbados cedars.

Among most Florida botanists Nassau County has the reputation of being a very poor field for the collector, but I have not found it so. Among spermatophytes I have collected several species that I have not found elsewhere in northern Florida and one which apparently is undescribed. Among pteridophytes are all the species commonly found in this portion of the state, as well as *P. nudum* and *Selaginella apoda*.

LYCOPODIUM ADPRESSUM (Chapm.) Lloyd & Underw. Nassau County, in various places.

LYCOPODIUM CAROLINIANUM L. Nassau County, in various places.

SELAGINELLA APODA (L.) Fernald. Nassau County: South Bank of St. Mary's River, Prospect Landing and King's Ferry.

SELAGINELLA ARENICOLA Underw. Clay County: In scrub-oak ridge, down center of dirt road and under ericaceous shrubs in pure, dry sand. A plant under six inches high and about the same across will have a circular root system with a radius of three feet. Not previously reported in northeastern Florida. This collection was probably made in Gold Head Branch State Park, but I had no means of knowing; it was found at the end of a dirt trail, after an arduous drive of ten miles through oak scrub, without signs of human habitation.

SELAGINELLA LUDOVICIANA A. Br. Clay County: Below Middleburg, along Black Creek, in open sun, on long rolling ridges, in soil partly composed of loose shell-rock.

ISOETES FLACCIDA Shuttlw. St. Johns County: Swamp, at south end of bridge, Palm Valley. This is the first record for northeastern Florida.

ISOETES ENGELMANNI A. Br. Duval County: About two miles outside the city limits of Jacksonville and one mile south of the Lake City road, just off Ramona Boulevard, growing on the steep bank of a small stream, about three feet above the water line. This is the first record of this species in Florida. A specimen was sent to the U. S. National Herbarium, and so identified by Mr. C. V. Morton.

The distribution of the calcicolous ferns in the various lime-sinks is very interesting. The Twin Sinks in the northern part of Marion County are two shafts, like organ pipes, sunk deep into the earth beneath a common rim, the dividing wall at the top being only three feet across. Above the middle of the deeper shaft is a heavy mass of *Adiantum*, completely inaccessible; it may be either *A. tenerum* or *A. capillus-veneris*. Otherwise the walls are covered with *Asplenium verecundum*, with a sprinkling of *A. heterochroum*. In the other sink are *A. abscissum*, *A. Curtissii*, *A. heterochroum*, *A. verecundum*, a remarkably crested form of *Pteris cretica*, and on the common rim above a number of fine plants of *Dryopteris uliginosa*. A few miles from the Twin Sinks, in the middle of a field, is a deep, well-like sink, its sides completely covered with *Asplenium abscissum* only, and about a hundred yards away, in the edge of the woods, a pocket-like sink bears a profusion of *A. heterochroum*, with a scattering of *A. verecundum*.

Thanks are due Don McKay, Naturalist, Orange Lake, Florida, for his interest in locating many of these lime-sinks and guiding me to them.

JACKSONVILLE, FLA.

New Lycopodium Gametophytes from New Jersey

HOLLIS KOSTER

On June 16, 1938, the writer collected material on the wet bank of a border ditch of Johnson's cranberry bog at Herman, Burlington County, New Jersey, which proved to be gametophytes of *Lycopodium alopecuroides* L. Twenty-two prothallia were collected at this station, one alone bearing a prominently developed sporeling. A few days later a single prothallium of the same species with an emerging sporophyte was found at a station close by. Shortly afterward a find of a number of prothallia of *L. alopecuroides*, many with sporelings attached, was made in a wet spot bordering a swamp at Weekstown, Atlantic County, New Jersey.

On October 19, 1938, the original station and other colonies of *L. alopecuroides* along the border of the same bog were searched, and this and subsequent searches yielded 60 gametophytes. On the same day it was discovered that *Lycopodium carolinianum* L. covered a portion of the floor of the same bog. Careful search was made, and prothallia of this species also were found abundantly, both with and without sporelings attached.

A station of *Lycopodium adpressum* (Chapm.) Lloyd & Underw. in an old sand pit with damp, savannah-like bottom at Crowleytown, Burlington County, New Jersey, was selected for search on October 22, 1938. Seven gametophytes and considerable sporeling material were collected.

These finds were made at typical stations of the mature plants in the pine-barren region of southern New Jersey. They appear to form the first records for gametophytes of these species and, further, the first notice of gametophytes of the aerial type in America.

It is perhaps desirable at this point to refer briefly to the quite scant history of finds of *Lycopodium* gametophytes and, later in the article, to attempts to grow gametophytes from spores.[1]

The first discovery of gametophytes was by Fankhauser, in 1872, for *L. annotinum* in Switzerland. In 1884 Treub noted an endophytic fungus in prothallia of *L. cernuum* found in Java. Not until 1917, when Spessard announced the discovery of those of five species of *Lycopodium* in Michigan, were *Lycopodium* gametophytes recorded for America. Since that time a few more stations have been reported in the United States from several states.

The subterranean type of gametophyte is found several centimeters below the surface of the ground, and commonly does not possess chlorophyll. The aerial type occurs on the surface of the ground, and possesses chlorophyll. The two types in general seem to be quite distinct, and each applies to particular species. However, Barrows quotes Holloway's record of *L. volubile* in New Zealand: "Prothallus growing on surface becomes green." The writer traced sporelings of *L. alopecuroides* to deep in the bases of cushions of *Sphagnum*, and although no prothallia were found, it seems certain that they had been present and undoubtedly had lacked chlorophyll. Hence in distinguishing an "aerial" type one meets minor technical difficulties.

During the seasons of 1938 and 1939 the writer paid particular attention to his field stations of *Lycopodium* gametophytes, but did not attempt to study the technical features of the bodies critically. Judgment as to locations for collection and the presence of sporelings en-

[1] Barrows, Florence L. Propagation of Lycopodium, 1. Spores, Cuttings, and Bulbils. Contr. from Boyce Thompson Institute, 7, no. 3: 267–294. 1935. Chamberlain, Charles J. Methods in Plant Histology, 5th ed., 294–295. 1932.

abled a placement as to species. The sporophytes of these three swamp-loving species can be distinguished from each other at a very early stage by the characteristic arrangement of the emerging leaves. The form of the young prothallium is that of an irregularly shaped tuber, usually not exceeding two or three millimeters in diameter. Dark-colored rhizoids are observable on the lower surface of the structure. The crown bears a varying number of slender, irregular branches with blunt apices. In older prothallia the branches are reduced to stumps touched with brown at the apex, or merely short, rounded protuberances.

The young gametophytes are generally of a somewhat more brilliant and deeper green than any of the surrounding hepatics. Bristling with tiny emergences, their appearance suggests miniature, green pin cushions. The fact that they occur in a highly scattered fashion makes close scrutiny of the ground necessary in order to detect them. One can be deceived by a concentration of green which turns out to be only a close tufting of tiny hepatics. Species of *Drosera* seem to be constant associates, and were valuable in localizing spots where gametophytes might be found. A pair of dissecting needles were used to remove the gametophytes from the soil, and a large lens was useful for close inspections.

The green prothallia, growing on soil and partly decayed organic matter, often bore tatters of yellowed, decayed portions in which the hyphae of the fungus grew abundantly. Often green portions of prothallia of the older type were found embedded in a soft, yellowish crust covering the surface of the ground, which appeared to be composed largely of fungoid material. Investigation showed that such were parts of much larger prothallial bodies, the size of which is uncertain because of decomposition by the fungus. It appears that the

older, yellowed portions become pulpy and partially filled with sand, while abundant mycorrhizal strands penetrate the much decayed interior, during which time the younger portions are still in process of growth.

In was found that gametophytes of *L. carolinianum* often grew on decayed stems of the mature plants, and a few were suspected of being attached to the epidermis of the white, living roots of the mature plants. Sporophytes developing from such gametophytes were at first confused with true innovations of the mature plants. The flattish, prostrate stems of this species lend themselves peculiarly to this type of occurrence of gametophytes.

Apparently because of the early appearance of decay, the prothallial bodies of these three species appear to range much smaller in size than is general for gametophytes of the subterranean type. They can also be said to be of more delicate composition and of shorter life than the latter. Certain gametophytes of the subterranean type investigated by Bruchmann were found to require several years both for the germination of the spores and the life of the gametophytes. On the other hand reports of the aerial type indicate rapid germination and short life for the latter. In the aerial types observed by the writer prothallial growth is rapid, and the entire cycle of life of the gametophytes seems to cover only a few months. These gametophytes were found most abundantly in the fall, but they have also been observed in summer and early spring. Oddly no gametophytes have been found in the current season (1940), and sporelings also have been seen but rarely. Clearly there can be severe fluctuations in the abundance of gametophytes of the aerial type in various seasons. This points to the likelihood that the appearance of gametophytes is governed by the conditions suitable for the growth of the

associated fungus, on which the germination of the spores has long been thought to be dependent.

Although gametophytes have been grown from spores by both Treub and Bruchmann, the situation remains that most investigators have been able to report the germination of spores of *Lycopodium* only to a few-celled stage. Obviously the technique of growing the gametophytes has not been satisfactorily mastered. In 1939 the writer sowed spores of *L. alopecuroides, L. carolinianum,* and *L. adpressum* on soil from gametophytic stations in a crudely conducted experiment. To his surprise gametophytes of *L. alopecuroides* and *L. carolinianum* of good size developed in from one to three months. The growing of the aerial type is thus undoubtedly a simpler problem than the culture of the subterranean type. The experiment also followed closely, in soil and probably other factors, conditions in the native habitat where gametophytes were currently growing. Dr. Lewis Knudson, of Cornell University, agreed to undertake experiments on this problem, and these are now in progress.

The paucity of records of stations for gametophytes of *Lycopodium* species constitutes a challenge to field botanists, particularly as the indications are that this paucity is due to lack of systematic search rather than to actual rarity of gametophytes. Anyone who has opportunity to observe stations of *Lycopodium* might well give attention to the matter. On account of the elusive nature of the quarry, a methodical sort of search is advised.

It is said that Dr. Spessard noted that in searching for gametophytes of the subterranean sort, one should first seek sporelings, and that these are more likely to be found about the borders of colonies of mature Lycopodiums than within the colonies. This suggestion is sound in seeking gametophytes of the aerial type also. It is clear that the mature plants of the swamp club-mosses com-

monly scamper from the points of origin to drier situations, where they spread out generously by vegetative branching. Thus one usually finds sporelings and prothallia where the mature stems occur in sparse fashion. The writer hesitates to define the habitat of the aerial type of gametophytes more closely, except to say that where it is *too* wet for hepatics gametophytes apparently do not grow.

Besides the species considered, *Lycopodium inundatum* L. is also known to possess the aerial type of gametophyte. That the occurrence of gametophytes of these species seems to be sporadic, both in situation and as to season, suggests that one should observe persistently, rather than devote intensive search to *Lycopodium* stations that show all signs of being barren at the time. When one finds *Lycopodium* plants scattered here and there, rather than in close tangles of stems, one is presumably in good hunting ground. The search will then be directed toward detecting plants closer to the sporeling stage. If small plants or sporelings are found, at times some traces of decayed gametophytes will still be attached to the bases of the plants. One can then feel assured that prothallia have been present at such points, and can undoubtedly be found there again. As one observes, one will learn to judge concerning the age of plants examined; in fact one should grow increasingly acquainted with the habits of *Lycopodium* plants, and thus become really expert in analyzing the economy of *Lycopodium* colonies with understanding. Certainly this is the proper method of approach.

Finally the interest and advice of the following persons during the course of this investigation are noted. These are Florence L. Barrows, D. A. Johansen, James Kezer, Lewis Knudson, and Loren C. Petry.

GREEN BANK, NEW JERSEY.

Lawson's Type Specimens

C. A. WEATHERBY

When compiling the "List of Varieties and Forms of the Ferns of eastern North America" I very soon realized that anyone dealing critically with them must take into account the several varieties proposed by Lawson,[1] and that some of these could not be interpreted certainly without examination of the specimens on which they were based. It therefore became of interest to ascertain whether such specimens existed.

The official biography of Lawson, as past president of the Royal Society of Canada, had stated that he had an herbarium, said "on very high authority to be the finest and most extensive private herbarium in Canada," and that it had become the property of Mount Allison University, Sackville, New Brunswick. References in Lawson's published writings to his "Indian herbarium" and to the acquisition of a set of Kearney's plants of Kentucky, and letters at the Gray Herbarium showing that he had purchased a set of Lindheimer's plants of Texas and one of Wright's Cuban ferns seemed to bear out the biographer's estimate of its scope and quality.

At the time it proved impracticable for me to visit Mount Allison; but last summer I was in New Brunswick and, through the courtesy of the University authorities, was enabled to examine the ferns in their herbarium. It

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[1] Lawson, George. Born Newport, Fifeshire, Scotland, Oct. 12, 1827. Student and instructor, Edinburgh University, 1848–58. Professor of Chemistry and Natural History, Queen's University, Kingston, Ontario, 1858–63. Professor of Chemistry, Dalhousie University, Halifax, Nova Scotia, and Secretary of Agriculture for Nova Scotia, 1863–95. Died Nov. 10, 1895. Author of "Synopsis of Ferns and Filicoid Plants of Canada," "Fern Flora of Canada," and numerous other papers relating to Canadian plants and their distribution. Biographical notices: Proc. Nova Scotian Inst. Sci. 9: *xxiii–xxxi* (1896); Proc. Roy. Soc. Canada, ser. 2, 2: app. B, 1–6 (1896).

soon became evident that some, at least, of Lawson's specimens were there. The set of Wright's ferns turned up promptly; so did John Bell's Gaspé collection, often cited in Lawson's "Synopsis of Canadian Ferns and Filicoid Plants." Then specimens of his own collecting began to appear, and finally authentic material of his novelties. Not all the specimens found are the actual types, but in all cases they are accompanied by labels in Lawson's handwriting and in two instances by notes or letters of transmittal from the original collectors, and so may be taken as accurately representing his concepts. All are unmounted, but in good condition.

Material of nine out of some 17 proposed varieties was found. The specimens are listed below, with data of collection as given on the labels, synonyms where needed, and notes as to identities. Those which appear to be actual types are indicated by asterisks. Names which should be used for such of the varieties as are now accepted are printed in small capitals. Lawson's Synopsis appeared in the Edinburgh New Philosophical Journal; that, rather than his title, is cited.

Asplenium thelypteroides* β *serratum*, Edinburgh New Phil. Journ., n. s. **19: 115 (reprint 15). 1864. ATHYRIUM THELYPTERIOIDES forma SERRATUM (Lawson) Gruber in AMER. FERN JOURN. **27**: 27. 1937. Belleville [Ontario], *J. Macoun*.—The specimen, a sterile blade, has the pinnules rather shallowly and obtusely serrate and broadly obtuse at the apex. The form is, therefore, not an extreme of *Athyrium thelypterioides* forma *acrostichoides*, as I had supposed, but belongs with typical *A. thelypterioides*.

*CYSTOPTERIS FRAGILIS var. MACKAYII, Fern Flora Canada, 233. 1889. Saw Mill Brook, North East Dalhousie, Pictou [Nova Scotia], July 30, 1875, *A. H. Mackay*.—I applied this name correctly (Rhodora **37**: 377)

to the plant common in Nova Scotia and New England. Lawson's specimen is a good one, much more representative than the rather abnormal material sent by Mackay to Davenport.

**Equisetum arvense* β *granulatum*, Trans. Bot. Soc. Edinburgh 7: 561. 1863. In the bed of the River Trent [Ontario], June 7, 1862, *George Lawson*.—The specimen, which bears two fertile culms and one very young sterile one, is as described by Lawson. The nodules are a not uncommon phenomenon in several species of *Equisetum*. They are supposed to be shortened and thickened internodes serving as storage-organs; their presence, or their relative abundance, would seem to be an insufficient basis on which to found a variety.

**Equisetum scirpoides* β *minus*, op. cit. 564. Dartmouth River, Gaspé, about ten miles from Gaspé Basin, June 19, 1862, *John Bell*.—The specimen seems to be ordinary *E. scirpoides*, somewhat stunted. I did not observe the glaucousness mentioned in the description.

Lastrea marginalis* β *Traillae*, Edinburgh New Phil. Journ. n. s. **19: 275 (repr. 19). 1864. *Nephrodium marginale* forma *tripinnatifidum* Clute, Fern Bull. **15**: 21. 1907; **19**: 50. 1911. *N. marginale* forma *Traillae* (Lawson) Clute, l. c. *Dryopteris marginalis* forma *tripinnatifida* (Clute) Weath. AMER. FERN JOURN. **26**: 61. 1936. D. MARGINALIS forma TRAILLAE (Lawson) Gruber in AMER. FERN JOURN. **30**: 89. 1940. Lakefield, North Douro, *Mrs. Traill*.—The specimen is exactly *D. marginalis* forma *tripinnatifida;* Lawson's name, much earlier than Clute's, must be taken up.

Lastrea Thelypteris β *glabra*, op. cit. 277 (repr. 21). Hamilton, Oct. 1863, *Judge Logie*.—This locality is not given with the original description; the specimen may have been collected after Lawson's manuscript had been sent to Scotland. It is a sterile blade, not quite glabrous, the costae being thinly pubescent, as are also the costules

on the upper surface. It probably represents Lawson's variety accurately enough; I have never seen a completely glabrous specimen of marsh fern.

Lastrea Thelypteris α *pubescens*, l. c. *Thelypteris palustris* var. *pubescens* (Lawson) Fernald, Rhodora **31**: 34. 1929. DRYOPTERIS THELYPTERIS var. PUBESCENS (Lawson) A. R. Prince ex Weath. AMER. FERN JOURN. **26**: 95. 1936. Owen Sound, 1869, *Mrs. Roy*.—This specimen, collected five years after the variety was described, of course can not be the type, but is no doubt representative. It is a fertile blade with the segments strongly revolute, rather densely short-pubescent on the rachis and along the veins on the upper surface and on the costae and, presumably, the smaller veins (hidden by the inrolled margins and the sporangia) beneath. As Professor Fernald has pointed out, Lawson's name. though not particularly appropriate, is applicable to all the marsh ferns of northeastern North America.

Woodsia glabella* β *Belli*, op. cit. 281 (repr. 24). Dartmouth River, 20 miles from mouth, Gaspé, C. E. [Canada East], July 3, 1862, *John Bell*.—Lawson was evidently in much doubt as to this specimen. A slip accompanying it reads: "*Woodsia laetevirens* var. of *glabella* ??, *ilvensis* ?, or *hyperborea* ??," and finally, in pencil, "*hyperborea* according to Eaton." Lawson eventually accepted Eaton's determination and reduced his variety (Trans. Bot. Soc. Edinburgh **8: 108. 1866). The specimen is a rather stout individual of *W. alpina*.

Woodsia ilvensis* β *gracilis*, l. c. Gaspé, 1862, *John Bell*.—This I interpreted correctly as a probable hybrid of *W. alpina* and *W. ilvensis* (AMER. FERN JOURN. **26: 11. 1936). See also Butters, op. cit. **31**: 15. 1941.

Whether or not the above are all the Lawson types extant, we cannot now be sure. Further search in Canadian herbaria may reveal others.

GRAY HERBARIUM.

Some Noteworthy Fern Communities of Arkansas[1]

DWIGHT M. MOORE

In nearly any region of Arkansas some ferns can be found. There are, however, certain stations or areas which are unusually rich in the number and variety of ferns. Some of these have been considered worthy of mention. Their location with reference to the rest of the state is indicated on the accompanying map. The nomenclature here used is that of Broun's *Index to North American Ferns* (2).

1. The region around Hot Springs National Park, Garland County, is particularly rich in ferns. Dr. F. J. Scully, 1937, (1), presented a list of 18 ferns which he had found in that vicinity and in 1939 (3) published in mimeographed form a bulletin of the ferns of that region as Number 5 of the local Natural History Journal in which he lists 26 different species and varieties. This is a very nice and reasonably complete list of the ferns of that region. To it may be added five other names.

Adiantum capillus-veneris L. has been found in one of the caves near Hot Springs by Mr. E. J. Palmer.

Athyrium asplenioides f. *subtripinnatum* Butters has been found with the typical form of the species in various situations in and near the region.

Dr. Scully lists *Cystopteris fragilis* var. *protrusa* Weatherby, but does not mention the typical form of the species. Collections of the latter have been made in nearby Magnet Cove, and in all probability it could be found at various other stations.

Diplazium pycnocarpon (Spreng.) Broun, also is among our records for the Hot Springs region, although not common.

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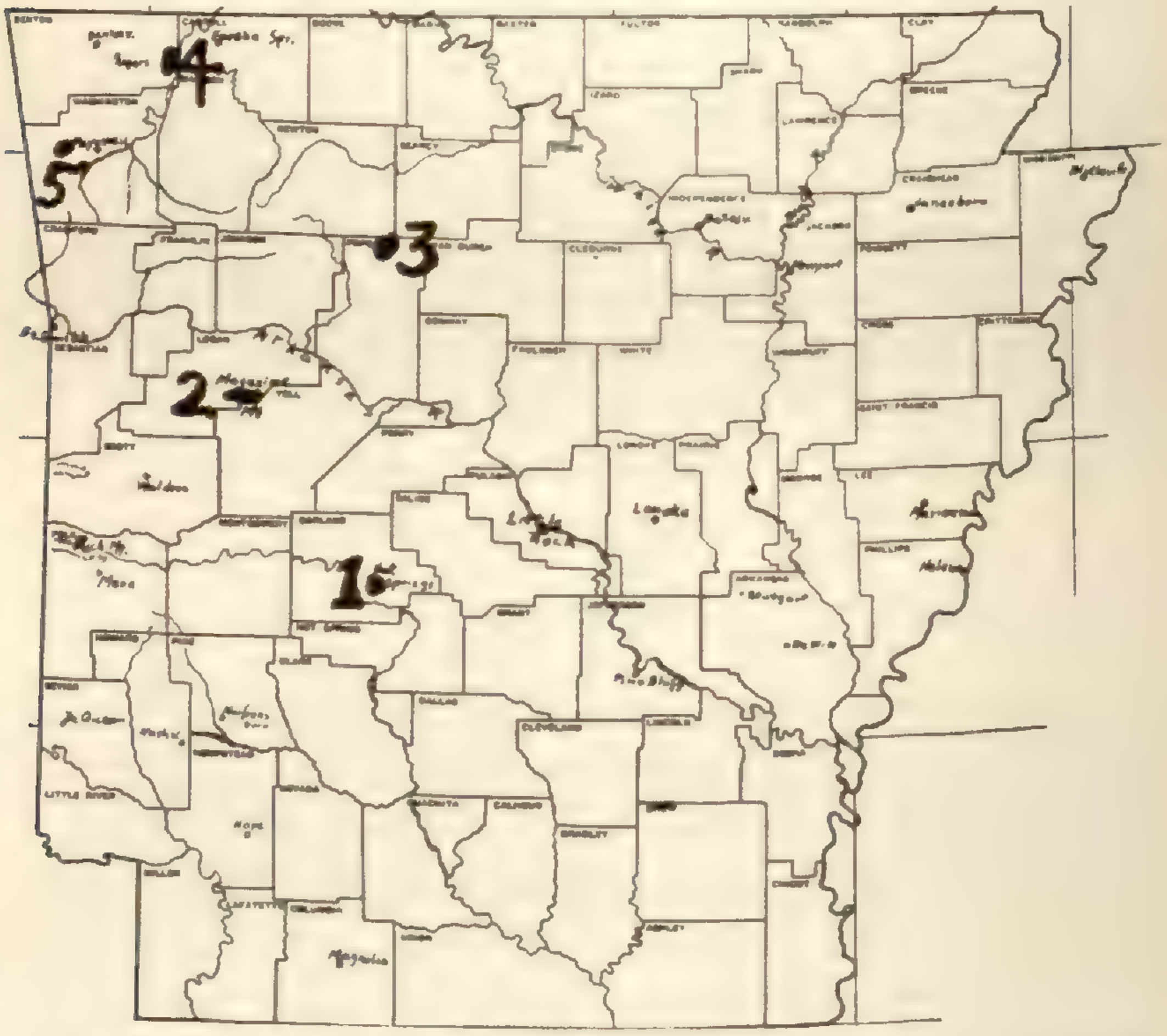
[1] Research Paper no. 652, Journal Series, Univ. of Arkansas.

The Silvery Spleenwort, *Diplazium acrostichoides* (Sw.) Butters [*Athyrium thelypterioides* (Michx.) Desv.] appears to have been the label on specimens distributed by Palmer from near Hot Springs, April 23, 1924 (no. 24513). This material has been identified by Dr. Butters as *Athyrium asplenioides*. We have no other record of



the Silvery Spleenwort in Arkansas, so for the present it must be eliminated from our inventory.

Pteridium latiusculum (Desv.) Hieron. has been collected at Magnet Cove, but, as Dr. Scully reports, the variety *pseudocaudatum* is decidedly the prevalent form on the hills around the park.

Although Dr. Scully includes *Athyrium angustum* (Willd.) Presl, on the basis of identification by Dr. Small, there may be some question about its occurrence. Dr. Butters is of the opinion that it does not extend so far south, and one specimen from the Hot Springs region.

distributed by E. J. Palmer under this name, has been identified by Dr. Butters as *Athyrium asplenioides* (Michx.) Desv. Until Dr. Scully's record is disproved, of course, the name should stand in the list for this region.

With these additions (marked with an asterisk), Dr. Scully's list would be augmented to 31 and would appear as follows; the names have not been changed to conform to Broun's Index (2).

1. **Adiantum capillus-veneris* L.
2. *Adiantum pedatum* L.
3. *Asplenium platyneuron* (L.) Oakes
4. *Asplenium resiliens* Kunze
5. *Asplenium trichomanes* L.
6. *Athyrium angustum* (Willd.) Presl
7. *Athyrium asplenioides* (Michx.) Desv.
8. **Athyrium asplenioides* f. *subtripinnatum* Butters.
9. *Botrychium obliquum* var. *tenuifolium* (Underw.) Gilbert
10. *Botrychium virginianum* (L.) Sw.
11. *Cheilanthes alabamensis* (Buckley) Kunze
12. *Cheilanthes lanosa* (Michx.) D. C. Eaton
13. *Cheilanthes tomentosa* Link
14. **Cystopteris fragilis* (L.) Bernh.
15. *Cystopteris fragilis* var. *protrusa* Weatherby
16. **Diplazium pycnocarpon* (Spreng.) Broun
17. *Dryopteris hexagonoptera* (Michx.) C. Chr.
18. *Dryopteris marginalis* (L.) Gray
19. *Dryopteris noveboracensis* (L.) Gray
20. *Onoclea sensibilis* L.
21. *Osmunda cinnamomea* L.
22. *Osmunda regalis* var. *spectabilis* (Willd.) Gray
23. *Pellaea atropurpurea* (L.) Link
24. *Polypodium polypodioides* (L.) Watt
25. *Polystichum acrostichoides* (Michx.) Schott
26. *Polystichum acrostichoides* var. *incisum* Gray
27. **Pteridium latiusculum* (Desv.) Hieron.
28. *Pteridium latiusculum var. pseudocaudatum* (Clute) Maxon.
29. *Selaginella apus* (L.) Spring
30. *Woodsia obtusa* (Spreng.) Torr.
31. *Woodwardia areolata* (L.) Moore

2. Magazine Mountain, Logan County, is one of the most outstanding topographic features of the state. Rising about 2500 feet above the surrounding valleys, it reaches an elevation which is considered the highest point in Arkansas and probably the highest between the Alleghenies and the Rockies. The top is generally dry, but numerous springs produce moist habitats in both sunny and shady situations. The rocks are mostly sandstone, but some are more or less calcareous.

This combination of various sites affords favorable habitats for species of widely divergent range. It is the only Arkansas station for *Woodsia scopulina* and *Dryopteris spinulosa*; and *Dennstaedtia punctilobula*, the Hay-scented Fern, found here, is reported from only one other Arkansas station—near Pine Bluff, Jefferson County.

Our records show the following 27 ferns on Magazine Mountain:

1. *Adiantum pedatum* L.
2. *Asplenium bradleyi* D. C. Eaton
3. *Asplenium platyneuron* (L.) Oakes
4. *Asplenium resiliens* Kunze
5. *Asplenium trichomanes* L.
6. *Athyrium asplenioides* (Michx.) Desv.
7. *Botrychium virginianum* (L.) Sw.
8. *Camptosorus rhizophyllus* (L.) Link
9. *Cheilanthes lanosa* (Michx.) D. C. Eaton
10. *Cheilanthes tomentosa* Link
11. *Cystopteris bulbifera* (L.) Bernh.
12. *Cystopteris fragilis* (L.) Bernh.
13. *Dennstaedtia punctilobula* (Michx.) Moore
14. *Diplazium pycnocarpon* (Spreng.) Broun
15. *Dryopteris marginalis* (L.) A. Gray
16. *Dryopteris spinulosa* (O. F. Müll.) Watt
17. *Isoetes melanopoda* Gay & Durieu
18. *Onoclea sensibilis* L.
19. *Pellaea atropurpurea* (L.) Link
20. *Phegopteris hexagonoptera* (Michx.) Fée
21. *Polypodium polypodioides* (L.) Watt

22. *Polypodium virginianum* L.
23. *Polystichum acrostichoides* (Michx.) Schott
24. *Pteridium latiusculum* (Desv.) Hieron.
25. ***Selaginella apoda*** **(L.) Spring**
26. *Woodsia obtusa* (Spreng.) Torr.
27. ***Woodsia scopulina*** **D. C. Eaton**

3. At Sand Gap in northern Pope County, the outcrops of the Winslow sandstone have weathered down to produce rich sandy loam which is well drained, but in some spots is perpetually wet. The area is densely covered with a mesophytic forest. Around a small persistent spring on the north slope of the gap, the soil above the spring is relatively dry, but below it is quite soggy, resulting in a typical *Alnus* thicket. Here within a radius of 50 feet the writer has recorded the following 15 ferns:

1. ***Adiantum pedatum*** L.
2. *Asplenium platyneuron* (L.) Oakes
3. ***Asplenium resiliens*** Kunze
4. *Athyrium asplenioides* (Michx.) Desv.
5. *Athyrium asplenioides* f. *subtripinnatum* Butters
6. ***Botrychium virginianum*** (L.) Sw.
7. ***Cystopteris fragilis*** (L.) Bernh.
8. *Dryopteris marginalis* (L.) A. Gray
9. ***Onoclea sensibilis*** L.
10. ***Osmunda cinnamomea*** L.
11. ***Osmunda claytoniana*** L.
12. *Osmunda regalis* var. *spectabilis* (Willd.) A. Gray
13. *Phegopteris hexagonoptera* (Michx.) Fée
14. *Polystichum acrostichoides* (Michx.) Schott
15. ***Selaginella apoda*** (L.) Spring

This is the only known Arkansas station for the Interrupted Fern, *Osmunda claytoniana* (5).

4. "Martin's" Bluff in the southeast corner of Benton County is of especial interest because of the unusual number of fern allies in addition to a good number of true

ferns. This is a bluff where the White River and its tributaries have cut into the Sylamore sandstone. On top of the bluff are displayed broad, relatively bare areas, some of which are dry, except during rainy seasons. Other portions are kept moist for longer periods by intermittent surface streams. Here *Isoetes melanopoda* is found in muddy places exposed to sunlight.

In more sheltered and more permanently moist situations are found:

1. *Asplenium platyneuron* (L.) Oakes
2. ***Asplenium resiliens*** Kunze
3. *Asplenium trichomanes* L.
4. *Athyrium asplenioides* (Michx.) Desv.
5. ***Cystopteris bulbifera*** (L.) Bernh.
6. *Cystopteris fragilis* (L.) Bernh.
7. *Diplazium pycnocarpon* (Spreng.) Broun
8. ***Dryopteris marginalis*** (L.) A. Gray
9. ***Onoclea sensibilis*** L.
10. *Phegopteris hexagonoptera* (Michx.) Fée
11. *Polypodium polypodioides* (L.) Watt
12. ***Polypodium virginianum*** L.
13. *Polystichum acrostichoides* (Michx.) Schott
14. ***Selaginella apoda*** (L.) Spring

In crevices on the cliff face *Osmunda cinnamomea* grows, often quite small, but frequently two feet or more in height. On drier faces of the cliff may be found *Asplenium bradleyi*, one of our rarer ferns.

It is quite interesting to note that both of our species of *Selaginella* occur here, *S. rupestris* above on the dry exposures (4), and *S. apoda* in the moist shady coves beneath the overhanging rocks. Near by on the bank of a tributary may be found *Equisetum laevigatum*. Our complete list for this small station follows:

1. ***Adiantum pedatum*** L.
2. ***Asplenium bradleyi*** D. C. Eaton

3. *Asplenium platyneuron* (L.) Oakes
4. *Asplenium resiliens* Kunze
5. *Asplenium trichomanes* L.
6. *Athyrium asplenioides* (Michx.) Desv.
7. *Cystopteris bulbifera* (L.) Bernh.
8. *Cystopteris fragilis* (L.) Bernh.
9. *Diplazium pycnocarpon* (Spreng.) Broun
10. *Dryopteris marginalis* (L.) A. Gray
11. *Equisetum laevigatum* A. Br.
12. *Isoetes melanopoda* Gay & Durieu
13. *Onoclea sensibilis* L.
14. *Osmunda cinnamomea* L.
15. *Phegopteris hexagonoptera* (Michx.) Fée
16. *Polypodium polypodioides* (L.) Watt
17. *Polypodium virginianum* L.
18. *Polystichum acrostichoides* (Michx.) Schott
19. *Selaginella apoda* (L.) Spring
20. *Selaginella rupestris* (L.) Spring

5. Savoy is a small community in western Washington County on Clear Creek, which at that place flows generally westward. The valley presents north hillsides which are relatively moist and rich in humus and south-facing slopes of limestone-chert which in summer are very dry. These two extremes present fern floras of unusual contrast within a very short distance of each other.

The north slope includes:

1. *Adiantum pedatum* L.
2. *Asplenium platyneuron* (L.) Oakes
3. *Botrychium virginianum* (L.) Sw.
4. *Camptosorus rhizophyllus* (L.) Link
5. *Cystopteris fragilis* (L.) Bernh.
6. *Diplazium pycnocarpon* (Spreng.) Broun
7. *Dryopteris marginalis* (L.) A. Gray
8. *Pellaea atropurpurea* (L.) Link
9. *Polystichum acrostichoides* (Michx.) Schott

The south slope includes:

1. ***Asplenium platyneuron*** (L.) Oakes
2. ***Cheilanthes alabamensis*** (Buckl.) Kunze
3. ***Cheilanthes lanosa*** (Michx.) D. C. Eaton
4. *Cheilanthes tomentosa* Link
5. *Notholaena dealbata* (Pursh) Kunze
6. *Ophioglossum engelmanni* Prantl
7. ***Pellaea atropurpurea*** (L.) Link
8. *Polypodium polypodioides* (L.) Watt
9. ***Pteridium latiusculum*** (Desv.) Hieron.
10. *Pteridium latiusculum* var. *pseudocaudatum* (Clute) Maxon
11. ***Woodsia obtusa*** (Spreng.) Torr.

It is interesting to note that only two of these, *Pellaea atropurpurea* and *Asplenium platyneuron*, occur in both situations.

While many of the Arkansas ferns are very widely scattered, there are a few which have been reported from only one, or possibly two stations, throughout the state. In the following list these rare Arkansas ferns are named with the places where they have been reported:

1. × *Asplenosorus ebenoides* (Scott) Wherry. Lee's Creek, Crawford County.
2. *Botrychium dissectum* Spreng. Farmington, Washington County.
3. *Botrychium dissectum* var. *tenuifolium* (Underw.) Farwell. Fulton, Hempstead County.
4. *Dennstaedtia punctilobula* (Michx.) Presl. Magazine Mt. and Pine Bluff.
5. *Dryopteris clintoniana* var. *australis* Wherry. Shirley, Van Buren County.
6. *Dryopteris cristata* (L.) A. Gray. Pine Bluff, Jefferson County.
7. *Dryopteris noveboracensis* (L.) A. Gray. Hot Springs, Garland County.
8. *Dryopteris spinulosa* (O. F. Müll.) Watt. Magazine Mountain, Logan County.
9. *Equisetum arvense* L. Northeast Washington County.
10. *Lycopodium adpressum* (Chapm.) Lloyd & Underw. Mill Creek, Saline County.
11. *Marsilea vestita* Hook. & Grev. Bradley-Drew County Line and Arkansas Post.

12. *Osmunda cinnamomea* f. *frondosa* (T. & G.) Britton. Malvern, Hot Spring County.
13. *Osmunda claytoniana* L. Sand Gap, Pope County.
14. *Pellaea atropurpurea* f. *cristata* (Trel.) Clute. West Fork, Washington County.
15. *Pellaea glabella* Mett. Bella Vista and White River, Benton County.
16. *Pilularia americana* A. Br. Fort Smith, Sebastian County.
17. *Polystichum acrostichoides* f. *incisum* (A. Gray) Gilbert. Hot Springs, Garland County.
18. *Woodsia scopulina* D. C. Eaton. Magazine Mountain, Logan County.

This list is here included in the hope that it will stimulate further search, so that the actual distribution of these ferns in Arkansas may be established.

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Shorter Notes

AN OSMUNDA CINNAMOMEA VARIANT.—Years ago Miss Billings made a fern garden near her residence in Woodstock, Vermont. Many plants of the three Osmundas were set on a gentle slope, and grew well, even luxuriantly, in the 20 years I have known the place. Several years ago a few of the Royal Ferns produced fruiting fronds late in the summer, but this was the only departure

from normal that was known in the colony until the latter part of June of last year (1940). Then it was discovered that most of the Cinnamon Ferns had no normal fertile fronds, but bore beautiful lacy fronds that appeared to be partly fertile. I recalled the illustration accompanying Dr. House's note on forma *frondosa* of *Osmunda cinnamomea*,[1] but these fronds did not at all resemble that. The upper third or so of the blades was crowded with leafy pinnae more delicate in texture, with pinnules more or less acutely notched, than in normal sterile pinnae. Then there would be several pairs of pinnae whose pinnules were deeply incised and crisped—I can find no word to describe properly their appearance—and edged, or rather fringed, with open sporangia. Below these, in some fronds, were several normal sterile pinnae; in others there were several pairs of fruiting pinnae, more delicate and open than usual; and in a few fronds these were followed by one or more sterile pinnae. The blades measured 16 to 24 inches in length; the stipes were 19 to 26 inches long, and bore very little of the cinnamon colored "wool" that usually clothes the stipes of fertile fronds.

Dr. House attributed the abnormal fronds of the plants he noted to the presence of road tar which covered the ground around the plants, and others have told me that the *frondosa* form was attributable to some injury to the plant. But so far as I could learn, nothing untoward had happened in this colony; its surroundings had not even been damaged by the hurricane of 1938.—E. M. KITTREDGE, *Vergennes, Vermont.*

UP HIGH.—About ten feet up in the fork of a red maple, a little back from State Street in Gorham village, Maine, grow two species of ferns from a bed of moss—

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[1] This JOURNAL **23**: 3. 1933.

Mnium, cushions of *Orthotrichum*, and *Pylaisia*. One is a wood-fern, *Dryopteris spinulosa* var. *intermedia*, its outward-curving fronds of rich green springing in a circle a foot high. It is a pretty, delicate, lacy fern, growing as lush as though in its woodland habitat. At the opposite edge of the fork-hollow grows a lady-fern, *Athyrium angustum*, whose pale green turns to gold in autumn. The children call them "tree-ferns."

Squirrels often sit beside these ferns, and birds—downy woodpeckers, myrtle warblers, vireos—flit about. Can the spores have been brought from the ground, by bird or squirrel? Or did they, floating in the air, happen to alight in this odd place?—LUCINA HAYNES LOMBARD, *Gorham, Maine.*

ADDITIONAL FORMS OF FERNS IN THE KUTZTOWN-FLEETWOOD AREA, PA.—Two forms of ferns additional to those previously mentioned by myself[1] have recently been found in this area:

ASPLENIUM PLATYNEURON forma FURCATUM Clute. One specimen found on shale rock in the third railroad cut northeast of Virginville, Pa., August 19, 1940. A frond forked at right angles near the top, previously found near Kutztown, may belong here.

POLYPODIUM VIRGINIANUM forma DELTOIDEUM (Gilbert) Fernald. One station on shale rocks in first railroad cut northeast of Virginville, Pa., collected June 15, 1940. On one plant, with six fronds, five fronds were form *deltoideum*. Another plant, with many fronds, had only two fronds of this form and a third plant had only one. All my specimens are less than four inches long and are triangular or ovate-triangular in outline.—C. L. GRUBER, *Fleetwood, Pa.*

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[1] This JOURNAL, 30: 41–49; 89–98. 1940.

MARGINAL SHIELD-FERN AND OTHER FERNS IN CAPTIVITY. —Is the "*elegans* variety" of the Marginal Shield-fern a definite variety or only a nutritional form? This question is prompted by a warning from Mr. C. A. Weatherby to the effect that, since plants are growing things, leaf-structure may not always be according to the usual. Mr. Norman Woodward has cautioned me along similar lines, and observation leads to the same conclusion.

Several normal plants of *Dryopteris marginalis*, collected in the wild and transplanted to more favorable ground, have outgrown their normal condition of narrow stately fronds, and passed to one marked by much broader fronds, with pinnae in which the inferior pinnules are much longer than the superior. Then, too, there is a marked tendency to become tripinnate. In fact, last year Mr. Weatherby determined one as *D. marginalis* forma *tripinnatifida*. This year, after further fertilizing, fronds from that plant are broad and the pinnules are very uneven in length, the lower much the longer. The blades are 40 cm. long by 30 cm. broad, a wide departure from normal.

I have noted also that under favorable growing conditions Christmas Ferns (*Polystichum acrostichoides*) tend toward forma *incisum* and forma *crispum*. All of which points to the accuracy of Mr. Weatherby's warning.

Most of my ferns were collected locally, where the native rock when decomposed gives a strong acid reaction. Some of them are growing upon such rocks, covered with decomposed leaves from hickory, maple, and oak trees. Others have some soil under the leaves.

My experience is that conditions of light are important. In general, the ferns do best where shaded on all sides, but open to the sky above and thus subjected to a little direct sunlight. The Royal Fern, the Broad Beech-

fern, and the Cinnamon Fern, where soil is good, prosper in full sun. Christmas Ferns grow excellently in the open, but they make much fruit and the fronds blast in the summer sun.

Although a considerable amount of moisture in the soil seems advantageous to the growth of ferns, I have found even the Crested and Spinulose shield-ferns growing in quite dry woodlands. My ferns under cultivation all appear happy so long as they have some moisture and a continuous and thick layer of leaf-mold covering the ground.—C. W. KINNEY, *Worcester, Massachusetts.*

Recent Fern Literature

The Karuk Indians of northern California wove baskets exceeding in beauty and symmetry any ever produced in Europe. In a recent publication[1] Dr. John P. Harrington has revealed the fact that two ferns played an important part in the weaving. These are the Maidenhair (*Adiantum pedatum* var. *aleuticum*) and the Chainfern (*Woodwardia fimbriata*). In the case of the Maidenhair the blade is broken from the stipe as soon as the frond is picked. The stalks may then be kept for some time. The Indians have observed the fact, usually overlooked by botanists, that the stipe of the Maidenhair is bicolorous. The "front" or ventral side is black and is tougher than the reddish dorsal side. The former is the important part for basketry. The process of preparation is described by Dr. Harrington as follows:

"A stick of almost any kind of wood, green or dry, is hunted for, but a green maple wood stick is preferred.

[1] Harrington, John P. Chainfern and Maidenhair, Adornment Material of Northwestern California Basketry. In, "So Live the Works of Man," pp. 159–162. 1939 (70th Anniversary Volume honoring Edgar Lee Hewett).

The end of the stick is split with a knife, and the Maidenhair stems are run back and forth through this split, each of them three or four times, to make them limber. This compresses the stem and tends to break the tissues so that the front and back can be pulled apart. Then, with the thumb nail or, sometimes nowadays with a pin, the anterior and posterior surfaces are pried apart at one end of the stem. The 'chest' side is then siezed with the teeth, and the 'back' side with the hand and thus front and back are pulled apart slowly all the way down the stem. The work of stripping the stem is hard on the hands and may cut them. The back is thrown away, and used only if one is careless about basketry, or has little material and is far from further source of supply. Sometimes, by modern makers, both hands are used instead of hand and teeth.

"The next act is to scrape the 'guts' off of the 'chest' with the thumb nail. This is easily done, because the 'gut' material is soft and scant. No attempt is made to reduce all the 'chests' to the same width, but they are built into the basket, some wide and some narrow, just as they occur.

"When it is desired to make the material blacker, a bundle of the 'chests' is taken and buried in the black mud of a spring, where it is allowed to remain for two or three days; if it were left longer it would become rotten. Then it is black on both sides, but if used without being soaked in mud, the inside is a lightish color.

"Sometimes the prepared stems, like the unprepared ones, are kept for years before using. Then one soaks the material and it is fine.

"Sometimes, when separating 'chest' and 'back,' a strand splits. When it splits it is used just the same as a narrow band. A large basket requires wide Maidenhair strands, a small basket uses narrow ones.

The finest work is done with very narrow ones. Some of these hairlike strands can be handled very neatly. The widest Maidenhair strands are three-sixteenths inch in width or more.

"The finished strands are not tied in large bundles, but in small ones, since it is known that only a few strands will be soaked up at a time, and that too large a quantity would become spoiled."

The Chain-fern and Maidenhair are used only for overlay, that is, for external ornamentation, the weave being complete without it. The color is permanent. This is the most glistening material used in the construction of baskets.—C. V. M.

American Fern Society

In cooperation with the Torrey Botanical Club a botanical tour of eastern New England will be available to members of the Fern Society in the period from June 21 to July 4. A tentative schedule of events is listed below. Persons may register for part or all of this program.

June 21. Assemble at Half Way House in East Jaffrey, N. H. Tenting will be available.

June 22. Climb Mt. Monadnock. Possibly visit Caroline A. Fox Research and Demonstration Forest.

June 23. To Durham. Field trip to Spruce Hole and Cedar Swamp in afternoon. Possibly trip to Botany Department, Harvard University. Accommodations in dormitories, University of New Hampshire, cabins, hotels; camping not available in the immediate vicinity. The University of New Hampshire offers an interesting program, "Our Underlying Resources." Also papers by Ecological Society and others of the A.A.A.S.

June 24. Scientific papers and University of New Hampshire program, "Conservation Education."

A.M. Field trip; boat trip, if conditions warrant.

P.M. York County flora.

June 25. Attend scientific meetings, or
A.M. Field trip to Nippo Pond.
P.M. 1: 30. Start for Mt. Washington via Lake Winnapesaukee, Franconia Notch, Crawford Notch, to Jackson, N. H. Group dinner at hotel to be selected later. (Cabins and camping facilities available.)

June 26. A.M. 9: 00. (NOTE: Parties remaining in Durham Wednesday night could reach Jackson by starting at 5 A.M.). Leave Pinkham Notch hut for Mt. Washington summit, (*a*) via Tuckerman Ravine, (*b*) via Carriage Road ($3.50–$5.00).
P.M. 1: 00. Meet at Alpine Gardens for picnic lunch, followed by brief talks on geology, botany, birds, and mammals of Mt. Washington. Choice of staying at Tip-Top House or returning to base.
Alternative: Foresters' field trip from Durham.

June 27. Further exploration of trails and summits of Mt. Washington vicinity.

June 28. Drive to Greenville, Maine. Overnight at Indian Hill Farm. Rooms, cabins, probably boating available. Squaw Mountain Inn for those who botanize in hotel lobbies.

June 29. A.M. Free period—Mountains available. Fill gasoline tank.
P.M. 3: 00. Meet at Ripogenus Gate House (42 miles, allow 2 hours) to cross dam on permit provided. It is essential that all cars be here at the one time, so that no one will have to wait. Overnight at sporting camp or tenting.

June 30–July 1. Climb Mt. Katahdin; no other means of ascent available, but life in a sporting camp is not unpleasant. Canoeing, local easier hikes, library, swimming (if you can take it) available. Some may take guide and equipment to stay out overnight or go to Chimney Pond Camp. Others may return to base and make other trips on July 1. Double Top and other trails are available. Fishing, of course.

July 2. Drive to Millinocket, Lincoln, and across to vicinity of Calais or Eastport.

July 3. Bogs, forests, coast.

July 4. Mt. Desert (Cadillac Mountain).

In view of the necessary reservations and permits, advance registration is required. The field chairman, Dr.

John A. Small, takes no responsibility for meeting anyone who has not registered. Parts of the trips for which there is no registration will be abandoned. Last minute changes may be necessary. Those registering will receive complete final schedule with rates, names of leaders, and further information. Address Dr. John A. Small, New Jersey College for Women, New Brunswick, New Jersey. Leaders for the Mt. Washington part will be Dr. H. I. Baldwin, Asst. Forester, Hillsboro, N. H., and Dr. C. F. Jackson, Chairman of Biological Institute, Durham, N. H., in whose care the field chairman may be addressed June 23–25. Leaders for the Maine part will be Dr. F. H. Steinmetz and his colleagues from the University of Maine, Orono.—R. T. CLAUSEN.

On Sunday, September 28, a field trip to Great Bear Swamp, Lake Owasa, Sussex County, New Jersey, will be held jointly by the American Fern Society and the Torrey Botanical Club, with Dr. Ralph C. Benedict as leader. This is the locality mentioned by Dr. Benedict in the last number of the JOURNAL, in commenting upon a news note in the *New York Times*, as one likely to prove interesting to fern students. Those desiring to participate should assemble at 10:30 at the junction of U. S. Route 206 and the road to the left, going down the eastern side of the lake. This is about two miles west of Branchville. Bring boots, field clothes, and lunch.

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Mr. W. Herbert Dole, 23 Overlook Ave., West Orange, N. J., has consented to serve as chairman of the special committee on increase of membership, mentioned in the last JOURNAL, and members are urged to get in touch with him. Descriptive circulars may be had from him upon request, or from Dr. R. C. Benedict, whose article, "The American Fern Journal through Thirty Years," appears in this number of the Journal. Reprints of this paper, as well as sample copies of this number, may be obtained from Dr. Benedict. Here is information a-plenty to bring to the attention of persons likely to be interested in the varied activities of the Fern Society. Let us all cooperate to double our membership!—W. R. M.

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R. C. BENEDICT C. V. MORTON

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CONTENTS

State and Local Fern Floras of the United States — S. F. Blake 81

Factors Determining the Distribution of Florida Ferns — Stephen H. Spurr 91

Asplenium adiantum-nigrum in Arizona — Edgar T. Wherry 97

Beware of "Lycopodium"! — Charles Whitebread 100

Notes on Dominica Ferns — W. H. Hodge 103

Shorter Notes — 112

Recent Literature — 115

American Fern Society — 118

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American Fern Journal

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State and Local Fern Floras of the United States

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In "Floras of the World, part I," now in process of publication by the United States Department of Agriculture, Miss Alice C. Atwood and I have brought together an annotated, geographically arranged catalogue of all the nominally complete floras and floristic works of present-day utility dealing with the vascular plants (or the phanerogams only) of Africa, Australasia, the oceanic islands, and North and South America. We have included also all works of similar scope on edible, medicinal, or useful plants in general, woody plants, vernacular names, and botanical bibliography. Popular works, partial works, and works now only of historical value have been excluded.

The great majority of the 517 state and local floras and systematic lists cited for the United States in "Floras of the World" include the ferns as well as the flowering plants. Books and articles dealing with Pteridophyta alone are not given in that work, except for a few which are definitely complementary to publications on the flowering plants.

The list here published is intended to include all state and local fern floras of the United States that have not been superseded, with all published supplements, and

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for the sake of completeness it takes in also the complete state floras (vascular plants) of all those that do not have a more recent state fern list. Secondary references have also been given to publications on the vascular plants of a given county or town whenever such treatments are more recent than the fern list cited. Papers containing additions to state fern floras that have come to my notice have been included, even if not published as direct supplements to printed floras, but no systematic search has been made for them. An asterisk is used to indicate state lists as distinguished from local lists. Taken together, this catalogue and that in "Floras of the World" should give an essentially complete list of the available pteridophyte floras of the United States.

To increase the utility of the present list, a reference has been given after the name of each state to the principal regional floras containing a descriptive treatment of the ferns of that state. The titles of these floras are abbreviated as follows: A (L. R. Abrams, An illustrated flora of the Pacific states . . . v. 1. 1923; Pteridophyta by William R. Maxon, except Isoetaceae, by N. E. Pfeiffer); BB (N. L. Britton and A. Brown, An illustrated flora of the United States, Canada and the British possessions . . . 2d ed. 3 v. 1913; Pteridophyta mostly revised by William R. Maxon); F (T. C. Frye, Ferns of the northwest[1] . . . 1934); G (Gray's new manual of botany, 7th ed. . . . rearranged and extensively revised by B. L. Robinson and M. L. Fernald. 1908); N (J. M. Coulter, New manual of botany of the central Rocky Mountains (vascular plants) . . . revised by Aven Nelson. 1909); R (P. A. Rydberg, Flora of the Rocky Mountains and adjacent plains . . . 2d ed. 1922; Pteridophyta mostly by Margaret Slosson); Rp (P. A. Rydberg, Flora of the prairies and plains of central North America. 1932); S (J. K. Small,

[1] See review by E. T. Wherry, A. F. J. 25: 65–68. 1935.

Flora of the southeastern United States . . . 2d ed. 1913; Pteridophyta revised by William R. Maxon); Sf (J. K. Small, Ferns of the southeastern United States. 1938).

All the species of Pteridophyta known from the United States up to 1900 are described in the 6th and last edition of L. M. Underwood, "Our Native Ferns," the latest technical treatment covering the whole area. All the true ferns known in the United States 60 years ago are illustrated in color in the two volumes of D. C. Eaton, "The Ferns of North America" (1877–80). The earlier checklists of the ferns of North America (north of Mexico) by John Robinson (1873), D. C. Eaton (1880), Davenport (1883), Gilbert (1901), Maxon (1901), and Clute (1905–08) have been superseded by Maurice Broun's "Index to North American Ferns" (1938), an alphabetical catalogue including all the species and minor forms of Pteridophyta, with synonymy and range but without descriptions. This lack is supplied in part in a paper by C. A. Weatherby, "A List of Varieties and Forms of the Ferns of Eastern North America," AMER. FERN JOURN. **25**: 45–51, 95–100. 1935; **26**: 11–16, 60–69, 94–99, 131–136. 1936; **27**: 20–24, 51–56. 1937. This is an annotated list of the infraspecific forms of Filicineae, with references and diagnoses, and it includes also some recently described species. Another useful paper by the same author is "Changes in the Nomenclature of the Gray's Manual Ferns," Rhodora **21**: 173–179. 1919.

A number of popular works on the ferns of the eastern United States were published from 1899 to 1906 by Clute, Dodge, Eastman, Parsons, Slosson, Waters, and others. There are two comparatively recent, pocket-size popular manuals: G. H. Tilton, "The Fern Lover's Companion" (1922), and E. T. Wherry, "Guide to Eastern Ferns" (1937). The former, which contains a brief bibliography, covers the northeastern states and adjacent Canada,

the latter the region from Pennsylvania and New Jersey to Virginia. The species of *Lycopodium, Selaginella, Isoetes,* and *Equisetum* are described in Wherry's book, but not in Tilton's.

The word "ferns" is often used in titles to include the fern allies as well as the proper ferns. In the annotations in this list the term Filicineae is used to cover Ophioglossaceae, Osmundaceae, Gleicheniaceae, Hymenophyllaceae, Schizaeaceae, Polypodiaceae, Marsileaceae, and Salviniaceae; the term Pteridophyta to include these and also Equisetaceae, Lycopodiaceae, Selaginellaceae, Isoetaceae, and Psilotaceae. The abbreviations A. F. J. and F. B. are used for American Fern Journal and Fern Bulletin, respectively; the other titles used for periodicals are given at sufficient length to be readily intelligible.

Acknowledgement should be made of the assistance obtained from the botanical subject catalogue in the library of the United States Department of Agriculture, the work of Miss Marjorie F. Warner, Miss Alice C. Atwood, and their assistants. The relative completeness of this catalogue, at least for the last 40-odd years, is evidenced by the fact that it included all but six of the really significant papers among the total of 314 primary and supplementary titles contained in the present list. The indices to the Fern Bulletin and the AMERICAN FERN JOURNAL have been examined, and the two journals themselves gone through completely. The local bibliographies given in many of the lists consulted have also been examined for additional titles.

ALABAMA (S, Sf)

***Graves, Edward W.** The fern flora of Alabama. A. F. J. 10: 65–82. *pl. 1.* 1920.—Topography, etc.; annotated list of Pteridophyta.—See also his Dicksonia rubiginosa at Mobile, Alabama. l. c. **24**: 51. 1934.

ARIZONA (N [northeastern part])

No general flora or state fern flora published. In press: Kearney, Thomas H., and Robert H. Peebles. Flowering plants and ferns of Arizona.—Tidestrom, Ivar, and Teresita Kittell. A flora of Arizona and New Mexico.—Both will include the Pteridophyta.

Ferriss, James H. The ferns of Cochise County, Arizona. F. B. 17: 1–7. 1909.—Running account of many of the species; unannotated list of Filicineae collected by author.

Little, Elbert L., Jr. Pteridophytes of Sierra Ancha, Arizona. A. F. J. 28: 144–151. 1938.—Life zones, etc; annotated list. (Gila County.)

ARKANSAS (S)

***Moore, Dwight M.** Arkansas Pteridophyta. A. F. J. 30: 105–119. 1940.—Notes on rarer species; annotated list; bibliography.

——— Some noteworthy fern communities of Arkansas. A. F. J. 31: 63–71. map. 1941.—Includes additions to Scully's 1939 list from Hot Springs National Park, with complete list from that locality; unannotated lists of Filicineae from Magazine Mountain, Logan County; Sand Gap, Pope County; Martin's Bluff, Benton County; Savoy, Washington County; list of rarer Arkansas ferns with localities; bibliography.

Scully, Francis J. Ferns of Hot Springs National Park and vicinity. A. F. J. 27: 59–62. 1937.—Soils, etc.; annotated list of Filicineae. (Garland County.)—See also his Ferns of Hot Springs National Park and vicinity. Nat. Hist. Journ. (Hot Springs Nat. Hist. Assoc.) no. 5. 37 pp. (incl. illus.). 1939. (Popular descriptive account of Pteridophyta, with figure of each species; processed publication.)

CALIFORNIA (A, F [central and northern part])

Cooke, William B. Some ferns of Mount Shasta. A. F. J. 29: 105–111. 1939.—Botanical explorations, etc.; annotated list of Pteridophyta.—See also his Flora of Mount Shasta. Amer. Midl. Nat. 23: 497–572. *pl. 1–8* (incl. map). 1940. (Includes Pteridophyta, p. 511–512.)

Dunkle, Meryl B. Ferns of the Channel Islands. Bull. So. Calif. Acad. Sci. 39: 2–5. 1940. (Contributions from the Los Angeles Museum.—Channel Islands Biological Survey 8.)—Annotated list of Filicineae.

Eastwood, Alice. Ferns of the Yosemite and the neighboring Sierras. Erythea 6: 14–15. 1898.—Unannotated lists of Filicineae of three collectors.—See also **Hall, Harvey M.**, and **Carlotta C. Hall.** A Yosemite flora: a descriptive account of the ferns and flowering plants, including trees, of the Yosemite National Park. vii, 282 pp., 170 fig., 11 pl. 1912. (Polypodiaceae, p. 25–40.)

***Jepson, Willis L.** A manual of the flowering plants of California. 1238 pp., 1023 fig. 1923–25.—Includes keyed descriptive account of Pteridophyta (p. 25–44, fig. 1–33).

Munz, Philip A., and **Ivan M. Johnston.** The distribution of southern California pteridophytes. A. F. J. 12: 69–77, 101–122. 1922; 13: 1–7. 1923.—Regions, etc.; annotated, keyed list of

Pteridophyta. Covers area east and south of Santa Barbara County, the desert part of Kern County, and the Channel Islands. —See also **Ewan, Joseph.** Recent fern notes from southern California. l. c. **21:** 106–109. 1931. More fern notes from California. l. c. **24:** 1–9. 1934. (Includes bibliography.) Annotations on west American ferns.—I. l. c. **25:** 86–95. 1935. (Includes bibliography, and is not restricted to southern California.)—Also **Tracy, H. H.** Brief notes on southern California pteridophytes. l. c. **26:** 87–91. 1936.

***Parish, Samuel B.** The fern flora of California. F. B. **12:** 1–15. 1904.—Additions . . . l. c. **12:** 82–83. 1904.—General features of flora; annotated list of Pteridophyta.—See also **Wheeler, Louis C.** Notes on California pteridophytes. A. F. J. **27:** 120–132. 1937 [1938].

Parsons, Mary E. The ferns of Tamalpais. Zoe **2:** 129–133. 1891.—Annotated list of Filicineae. (Marin County.)

Pember, Franklin T. The Colorado Desert for ferns. A. F. J. **2:** 12–15. 1912.—Running account of Pteridophyta.

Tracy, Hiram H. Ferns collected in the Noyo River canyon, Mendocino County, Calif., Aug. 10–14. A. F. J. **4:** 64–65. 1914. —Unannotated list of Pteridophyta; includes also similar list from the region of Mount Shasta.

———. Roughing it to the Yosemite. A. F. J. **2:** 107–114. 1912.—Running account of Filicineae.

Wiggins, Ira L. The pteridophytes of San Diego County, California. A. F. J. **22:** 33–42, 87–93. 1932.—Life zones, etc.; annotated list.—See also **Cota, F. M.** Further notes on . . . l. c. **23:** 77–83. 1933.

COLORADO (N, R)

***Wherry, Edgar T.** Colorado ferns. A. F. J. **28:** 125–140. *pl. 12*, map. 1938.—Annotated list of Pteridophyta, alphabetically arranged.

CONNECTICUT (BB, G)

See also ***Knowlton, C. H.**, under New Hampshire; ***Taylor, N.**, under New Jersey; ***Small, J. K.**, under New York.

***Bissell, Charles H.** The fern flora of Connecticut. F. B. **14:** 1–11. 1906.—Topography, rocks; annotated list of Pteridophyta.

[Foote, Mrs. E. M.] Ferns of Cornwall, Connecticut. A. F. J. **16:** 124–127. 1926.—Unannotated list of Filicineae. (Litchfield County.)

***Graves, Charles B.**, and others. Catalogue of the flowering plants and ferns of Connecticut growing without cultivation. Bull. Conn. Geol. & Nat. Hist. Surv. 14. 569 pp. 1910.—**Harger, Edgar B.**, and others. First supplement. Additions to the flora of Connecticut. l. c. Bull. 48. 94 pp. 1930 [1931].—Includes (p. 17–33; supplement, p. 9–14) annotated list of Pteridophyta.

Underwood, Lucien M. The Pteridophyta of Litchfield County, Ct. Bull Torrey Club **11:** 7–8. 1884.—List, mostly unannotated.

Upham, Alan W. A list of ferns found in Woodstock, Conn. A. F. J. **12:** 96–97. 1922.—Unannotated list of Filicineae. (Windham County.)

DELAWARE (BB, G)

No general flora or state or local fern lists.

DISTRICT OF COLUMBIA (BB, G)

***Maxon, William R.** Ferns of the District of Columbia. A. F. J. 9: 38–48. 1919.—Botanical districts, etc.; annotated list of Pteridophyta.

FLORIDA (S, Sf)

***Correll, Donovan S.** A county check-list of Florida ferns and fern allies. A. F. J. **28:** 11–16, 46–54, 91–100. map. 1938.—Annotated list of Pteridophyta, with counties and collectors given; bibliography.—See also **Diddell, Mary W.** New stations for Florida pteridophytes. l. c. **31:** 48–52. 1941.

***Curtiss, Allen H.** The fern flora of Florida. F. B. **12:** 33–38. 1904.—Annotated list of Pteridophyta.—See also **[Clute, W. N.]** New stations for Florida ferns. l. c. **20:** 75. 1912.

Eaton, Alvah A. Pteridophytes observed during three excursions into southern Florida. Bull. Torrey Club **33:** 455–486. 1906.—Author's itinerary, topography, etc.; annotated list of species collected in 1903–05, chiefly in Dade and Monroe Counties.

Harper, Roland M. The fern grottoes of Citrus County, Forida. A. F. J. **6:** 68–81. *pl. 5.* 1916.—Botanical explorations; annotated list of Filicineae of a rugged limestone area.

St. John, Edward P., and **Robert P. St. John.** Fern study in central Florida. A. F. J. **25:** 33–44. 1 fig., *pl. 3.* 1935.—Includes annotated list of Filicineae from Citrus, Sumter, and Hernando Counties.—See also **St. John, E. P.** Rare ferns of central Florida. l. c. **26:** 41–50. *pl. 4* (map). 1936.

Satchwell, Mary W. Ferns of Duval County, Florida. A. F. J. **6:** 39–42. 1916.—Annotated list of Filicineae.

***Small, John K.** Ferns of Florida; being descriptions of and notes on the fern-plants growing naturally in Florida. viii, 237 pp., illus. 1931.—Topography, phytogeography, etc.; annotated descriptive account of Pteridophyta, with figure of each species.

———. Ferns of Royal Palm Hammock; descriptions and illustrations of the ferns and fern-allies growing naturally in Royal Palm Hammock and the adjacent Everglades. vii, 39 pp., illus., pl. 1918.—Descriptive account extracted from his "Ferns of tropical Florida."

———. Ferns of tropical Florida; being descriptions of and notes on the ferns and fern-allies growing naturally on the Everglade Keys and Florida Keys. ix, 80 pp., illus., 5 plates. 1918.—Geology, etc.; annotated descriptive account, with figure of each species.

GEORGIA (S, Sf)

***Harper, Roland M.** The fern flora of Georgia. F. B. **13:** 1–17. 1905.—Topography, rocks, botanical explorations; annotated list of Pteridophyta.—See also note by **Green, H. A.,** l. c. **13:** 88. 1905, correcting *Pteris cretica* to *P. serrulata.*—Also **Gilbert, Benjamin D.** Mrs. Taylor's Georgia ferns. l. c. **13:** 108–109. 1905.

Pyron, Joseph H., and **Wilbur H. Duncan.** Vittaria lineata from Lincoln County, Georgia. A. F. J. **29**: 142–144. *pl. 11.* 1939 [1940].—Includes list of Filicineae from Graves Mountain, Lincoln County.

Taylor, Mrs. Augustus P. (Elfreda B.). How and where ferns grow in southwest Georgia. F. B. **13**: 53–60. 1905.—Includes running account of Filicineae of vicinity of Thomasville, Thomas County.

IDAHO (F, N [southern part], R)

No general flora or state fern list.

Worley, Clair L., and **Louis K. Mann.** Notes on Idaho ferns. A. F. J. **27**: 112–120. *pl. 5–7.* 1937.—Annotated list of Pteridophyta collected by the authors in Sawtooth Mountains, central Idaho.

ILLINOIS (BB, G)

***Hill, Ellsworth J.** The fern flora of Illinois. F. B. **20**: 33–43, 73. 1912.—Soils, etc.; annotated list of Pteridophyta.

Steagall, Mary M. Some Illinois Ozark ferns in relation to soil acidity. Trans. Ill. State Acad. Sci. **19**: 113–137. 1926.—Includes partly annotated list of Filicineae (p. 115–116). (In Jackson, Union, and Johnson Counties.)

INDIANA (BB, G)

Cain, Stanley A. Plants of Spring Mill State Park, Lawrence County, Indiana. I.—Ferns. Proc. Indiana Acad. Sci. **41** (1931): 97–98. 1932.—Annotated list of Pteridophyta.

***Deam, Charles C.** Flora of Indiana. 1236 pp., illus. 1940.—Annotated list including Pteridophyta (p. 37–66), the range of each species shown on a map; bibliography.

***Greene, Frank C.** The fern flora of Indiana. F. B. **19**: 102–115. map. 1911 [1912].—Topography, geology, etc.; annotated list of Pteridophyta.—See also **Hill, E. J.** Additions . . . l. c. **20**: 25–26. 1912.—Also **[Clute, W. N.]** Fern flora of Indiana. l. c. **20**: 81–82. 1912.—Also **Deam, C. C.** Cheilanthes lanosa and Isoetes in Indiana. A. F. J. **7**: 112–114. 1917.

———. Ferns of Bloomington, Indiana. F. B. **16**: 68–69. 1908.—Running account of Filicineae. (Monroe County.)

———. Notes on Indiana ferns. F. B. **17**: 12–15. 1909.—Includes unannotated lists of Filicineae from Kosciusko, eastern Greene, Martin and Orange, Floyd, and Crawford Counties, and from Indiana University Farm, Lawrence County, with notes on topography, etc.

Kriebel, Ralph M. Pteridophytes of Lawrence County. Proc. Indiana Acad. Sci. **44** (1934): 47–52. 1935.—Annotated list.

Test, Frederick H. Pteridophytes of Turkey Run State Park. Proc. Indiana Acad. Sci. **39** (1929): 115–118. 1930.—Annotated list. (Parke County.)

Tryon, Rolla M., Jr. Ferns of the dune region of Indiana. Amer. Midl. Nat. **17**: 425–429. 1936.—Habitats, etc.; annotated list of Filicineae. (Southern tip of Lake Michigan from Michigan City to Gary.)

IOWA (BB, G, Rp)

Conrad, Henry S. A manual of the ferns and "fern-allies" of Grinnell and vicinity. Proc. Iowa Acad. Sci. **29** (1922): 317–327. (1923?)—Annotated list with keys and brief descriptions. (Poweshiek County.)

Fitzpatrick, Thomas J. The fern flora of northeastern Iowa. A. F. J. **8**: 97–103. 1918 [1919]. (Contr. Dept. Bot. Univ. Nebr. no. 22.) (Also in Proc. Iowa Acad. Sci. **25** (1918): 417–421. 1919.)—Topography, geology, etc.; annotated list of Pteridophyta. (Winneshiek, Allamakee, Clayton, and Dubuque Counties.)

*——— and **Mary F. L. Fitzpatrick.** The fern flora of Iowa. F. B. **11**: 65–71. 1903.—Rocks, etc.; annotated list of Pteridophyta. —See also **Lyness, A. S.** Notes on the fern flora of Iowa. A. F. J. **23**: 39–49. 1933.

***Lyness, Arthur S.** Keys to the ferns of Iowa. A. F. J. **27**: 132–135. 1937; **28**: 16–25. 1938.—Essentially unannotated keys to genera and species of Pteridophyta.

***Melhus, Irving E.** Native ferns of Iowa. Iowa State Coll. Ext. Circ. 225. 52 pp., 16 fig., map. 1936.—Annotated list with key to genera and popular descriptions, the range of each species shown on a map.—See review in A. F. J. **27**: 135–136. 1937 [1938].

***Pammel, Louis H.,** and **Charlotte M. King.** The vascular cryptogams of Iowa and the adjoining parts of southeastern Minnesota and western Wisconsin. Proc. Iowa Acad. Sci. **9**: 134–151. plates, maps. 1902.—Habitats, etc.; annotated list with citation of localities and collectors, the distribution of each species shown on a map.

***Shimek, Bohumil.** Iowa Pteridophyta. Bull. Lab. Nat. Hist. State Univ. Iowa **5**: 145–170, 213–215. 1901.—Annotated list, with localities and collectors.

KANSAS (BB, G [eastern part], Rp)

***Gates, Frank C.** Annotated list of the plants of Kansas: ferns and flowering plants. (Cover title, Flora of Kansas.) 266 pp., illus. (maps). 1940. (Dept. Bot. Kansas State Coll. Contr. 391). —Annotated list including Pteridophyta (p. 104–105), the range of each species shown on a small map.

Reed, Minnie. Ferns of Wyandotte County. Trans. Kansas Acad. Sci. **14**: 150–151. 1896.—Running account of Filicineae of vicinity of Argentine.

KENTUCKY (BB, G)

Anderson, William A., Jr., and Ann R. Anderson. Ferns of the vicinity of Irvine, Kentucky. A. F. J. **17**: 130–133. 1927.—More ferns . . . l. c. **19**: 58–59. 1929.—Geology, etc.; annotated list of Filicineae. (Estill County.)

Holbert, George K. Ferns of Hardin County, Kentucky. A. F. J. **27**: 91–97. 1937.—Topography, etc.; annotated alphabetical list of Filicineae.

***McCoy, Thomas N.** The ferns and fern allies of Kentucky. A. F. J. **28**: 41–46, 101–110. 1938.—Annotated list, giving distribution by counties, with key to the species.—See also **Clausen, Robert T.** Two ferns new to Kentucky. l. c. **30**: 27–28. 1940.

———. The Pteridophyta of Rowan County, Kentucky. Journ.

South. Appalach. Bot. Club 1: 37–39. 1936.—Topography, etc.; unannotated list of Pteridophyta.

***Williamson, John.** Ferns of Kentucky, with sixty full-page etchings and six wood cuts, drawn by the author, illustrating structure, fertilization, classification, genera, and species. 154 pp., 5 fig., 60 pl. 1878.—Descriptive account of Filicineae, with plate of each species.

Youmans, William B. Ferns of the Mammoth Cave National Park region. A. F. J. **23**: 113–116. 1933 [1934].—Soils, etc.; annotated list of Filicineae. (Edmonson County.)—See correction (of *Woodsia scopulina*), l. c. **25**: 17. 1935.

LOUISIANA (S, Sf)

***Brown, Clair A.** Some wild flowers of Louisiana. V, Ferns and fern allies. Louisiana Conservation Review **5** (1): 12–23. 19 fig. 1936.—Annotated list, with key and brief descriptions; popular treatment.—See also **Wherry, E. T.** A. F. J. **28**: 30. 1938. (Adds 3 species.)

***Clute, Willard N.**, and **Reginald S. Cocks.** The fern flora of Louisiana. F. B. **11**: 1–5. 1903.—Botanical explorations, soil, etc.; annotated list of Pteridophyta.—See also **Cocks, R. S.** Notes from Louisiana. l. c. **12**: 110–111. 1904.

MAINE (BB, G)

See also ***Knowlton, C. H.**, under New Hampshire.

Abbott, Mrs. Frederick P. Ferns along the Saco from Salmon Falls to the sea. Maine Nat. **3**: 23–25. pl. 1923.—Running account of Filicineae, with unannotated list of species. (York County.)

Clark, Josephine F. Ferns of the Red River country, Maine. Rhodora **32**: 133–136. 1930.—Includes annotated list of Filicineae. (Aroostook County.)

Coburn, Louise H. Ferns of Skowhegan and vicinity. Maine Nat. **3**: 11–14. pl. 1923.—Running account of Filicineae, with unannotated list of species. (Somerset County.)

Davenport, George E. Ferns of Maranacook, Maine. Rhodora **1**: 218–220. 1899.—Annotated alphabetical list of Filicineae. (Kennebec County.)—See also **Metcalf, Haven.** Notes on the ferns . . . l. c. **3**: 236–237. 1901.

***Fellows, Dana W.** The fern flora of Maine. F. B. **14**: 97–104. 1906.—Topography, etc.; annotated list of Pteridophyta.

Knowlton, Clarence H. Ferns and their allies in southern Franklin County, Maine. A. F. J. **4**: 57–64. 1 fig. 1914.—Running account of Pteridophyta.

———. Ferns and their allies in Washington County, Maine. A. F. J. **19**: 82–87. 1929.—Annotated list of Pteridophyta.

Murch, Flora. Ferns of South Paris and vicinity. Maine Nat. **3**: 54–55. 1923.—Unannotated list of Filicineae. (Oxford County.)

Nye, Harriet A. Ferns of Fairfield. Maine Nat. **3**: 52–54. 1923.—Annotated list of Filicineae. (Somerset County.)

Nylander, Olaf O. Notes on Aroostook County ferns. Maine Nat. **4**: 40–42. 1924.—Annotated list of Filicineae.

Pitman, Mrs. Fred H. Fern memoranda. Maine Nat. **4**: 42–44. 1924.—Includes unannotated list of Filicineae from Winthrop, Kennebec County.

(To be concluded)

Factors Determining the Distribution of Florida Ferns[1]

STEPHEN H. SPURR

Florida ferns present many peculiarities of distribution. These have been discussed by Small[2] and E. P. St. John[3] and a hypothesis explaining the distribution of some of the species has been presented by the latter. In view of recent floral[4] and geologic investigations it seems advisable to reopen the subject and to inquire further into the factors determining the distribution of Florida ferns.

Difference of opinion centers upon the distribution of the tropical and subtropical species in Florida and it is to these groups, therefore, that the discussion will largely be confined. According to the St. John hypothesis the tropical and subtropical ferns in Florida compose a relict of an earlier and far richer "Oligocene island" flora that once existed in what is now roughly the northwest quarter of the Florida peninsula. Much of this flora was, supposedly, exterminated during the Pleistocene epoch; a few species, however, migrated to the then recently emerged southern tip of Florida and a few were able to survive in habitats protected from the uncongenial climate. These species have persisted to the present time, constituting a relict flora declining under unfavorable climatic conditions.

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[1] Acknowledgement is due to C. A. Weatherby of the Gray Herbarium and P. R. Gast of the Harvard Forest for criticizing the manuscript.

[2] J. K. Small: Ferns of Florida (Lancaster, Pa., Science Press. 1931.)

[3] E. P. St. John: Rare Ferns of Central Florida, I. Some Peculiarities of Distribution. AMER. FERN JOURN. 26: 41–50. 1936.

[4] Stephen H. Spurr: Notes on the Distribution and Habits of the Ferns of Northern Peninsular Florida. Proc. Fla. Acad. Sci., 5. 1940.

From the geological viewpoint the date of final emergence of the first portion of the Florida peninsula becomes, of course, of importance as the earliest possible time to which the migration of present species into Florida can be assigned. Unfortunately, geological evidence is not clear on this point. According to St. John,[5] this final emergence took place in the Oligocene epoch.[6] Schuchert, however, in his monograph on the historical geology of the Caribbean region,[7] states that permanent land has probably existed only from the middle Miocene. Then again, Cooke and Mossom, in the most exhaustive summary of Florida geology yet published,[8] state that during one or more stages of the Pleistocene the entire state may have been covered by water, "although indisputable evidence of such widespread submergence is not yet at hand." A study of sea level fluctuations by Cooke[9] shows that at the maximum flood stages of the Pleistocene, if any land was not submerged, it consisted of about a half-dozen small islands, the largest not more than 10 by 40 miles in size. Of these possibly existent islands only one was located in the "Oligocene island" region of St. John, that being an area about 15 miles square near the present city of Gainesville. The other islands were located to the north and east.

While it is therefore possible that present fern species have continuously inhabited Florida since Tertiary times, considerable doubt exists as to whether these plants could

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[5] Op. cit. 45.

[6] The chronological order of the geologic time units referred to is as follows: Cretaceous; Tertiary, including Eocene, Oligocene and Miocene; Quaternary, including Pleistocene and Recent.

[7] C. A. Schuchert: Historical Geology of the Antillean-Caribbean Region (New York: John Wiley. 1935).

[8] C. Wythe Cooke and Stuart Mossom: Geology of Florida. Twentieth Ann. Rept. Florida State Geol. Surv., pp. 29–228. 1929.

[9] C. Wythe Cooke: Scenery of Florida. Florida Geol. Bull. No. 17. 1939.

have survived through the Pleistocene epoch. Migrations of these species to Alabama and Georgia and consequent survival there during this period is exceedingly unlikely, due to the recurring rigorous climates at that time.

Two paths of migration leading to Florida have been open from the south: one, by way of Cuba across the Florida Straits, the other along the shores of the Gulf of Mexico. There appears never to have been a land bridge between Florida and Cuba or Florida and the Bahamas. These lands are now as close as ever before in the past, only 90 miles of water separating Cuba from the Florida Keys. During Tertiary times this gap was probably never less than 300 miles wide, due to the continued submergence of southern Florida. Fern migration by means of wind-blown spores between these lands, therefore, is of higher probability since the Pleistocene than in previous times.

No geologic fern records exist from Florida. From paleobotanical evidence elsewhere, however, and from other paleontological evidence, we are able to infer certain generalities concerning past climates and floras. At least four modern fern genera that occur in Florida—*Dryopteris, Adiantum, Polypodium,* and *Acrostichum*—are known from the Cretaceous.[10]

In the lower Eocene the Wilcox flora indicates a warm temperate or tropical climate and contains two species of *Asplenium* of types readily matched by existing Central American species. Other fern genera found in this flora include *Lygodium, Acrostichum,* and *Anemia.*[11]

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[10] William C. Darrah: Principles of Paleobotany (Leiden, Chronica Botanica Co. 1939).

[11] Edward W. Berry: The Affinities and Distribution of the Lower Eocene Flora of Southeastern North America. Proc. Amer. Phil. Soc. **53**: 129–250. 1914.

The two former are common in the Claiborne and Vicksburg floras and in Tertiary floras generally.[12]

It seems evident that through much of the Tertiary the southeastern states supported floras comparable to that of northern peninsular Florida today.[13] On the other hand, there is little likelihood of the more tropical members of such a flora having persisted in Florida through the Pleistocene epoch, even admitting the existence of continual emergence. The Pleistocene flora of an area near Baton Rouge, Louisiana, now bearing a similar flora to that of parts of northern Florida, contained such species as white spruce, white pine and larch.[14] The southern limits of distribution of these species now lies 500 to 1500 miles farther north than the northernmost stations of our subtropical Florida ferns. Associated mammalian remains in the Louisianan flora include the tapir and the mastodon. These are known also from the Florida Pleistocene, as well as many other north-temperate species of that time. Several of these which have persisted to the present do not occur in the southern half of the United States. Furthermore, at its maximum stage, the edge of the ice sheet was within 700 miles of Florida.

From another viewpoint, persistence of tropical plants in Florida through the Pleistocene involves the existence of sites where the micro-climates were suitable. If general climatic conditions since the Pleistocene have remained unsuitable (an assumption of the St. John

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[12] The Wilcox flora is from the lower Eocene of the Gulf States from Alabama to the Rio Grande; the Claiborne from the middle Eocene from Georgia to northern Mexico; and the Vicksburg from the Oligocene of Mississippi.

[13] Edward W. Berry: Tertiary Floras of Eastern North America. Bot. Rev. 3: 31–46. 1937.

[14] Clair A. Brown: The Flora of Pleistocene Deposits in the western Florida Parishes, West Feliciana and East Baton Rouge Parishes, Louisiana. Louisiana Dept. Cons. Geol. Bull. No. 12, pp. 59–96. 1938.

hypothesis), it follows that such sites have persisted to the present. Practically all of the present topography, however, is of post-Pleistocene origin,[15] the lime formations which support the epipetric species that constitute the bulk of our tropical ferns in northern Florida being especially youthful. The author has found every fern species in northern peninsular Florida, with the possible exception of two of the Lecanto spleenworts, on post-Pleistocene habitats. Nearly a third of these species are not found in older habitats. Several species, including *Asplenium abscissum*, *A. verecundum*, and *Goniopteris reptans*, are common on newly created habitats.

Considering the widespread submergence of Florida in the Pleistocene, the north-temperate climate that appears to have existed following this submergence, and the lack of persistent habitats capable of sheltering the species in question, it seems highly unlikely that tropical and subtropical fern species were able to survive this epoch in Florida. Although species similar to those at present inhabiting the peninsula undoubtedly lived on emergent land in this region in Tertiary times, the author is of the opinion that the largest present portion of the tropical fern flora dates only from the post-Pleistocene. In recent geologic times climates have been warmer than at present, but not much more severe.[16]

The native ferns of Florida are predominantly Caribbean in character. The list of endemic fern species is not very impressive; taxonomic doubt minimizes at present the importance of endemic species in *Thelypteris* and *Ophioglossum*. *Thelypteris macilenta* is known from only one collection, and the most common Adder's-tongue, *O. floridanum*, has been classified as synonymous

[15] N. M. Fenneman: Physiography of Eastern United States (New York, McGraw-Hill, 1938), pp. 50–52.

[16] Charles F. Brooks, Editor: Some American Papers and Notes on Climatic Variations. Bull. Amer. Met. Soc. 19: 1–224. 1938.

with a pantropic species.[17] The specific status of the three Aspleniums collected at Lecanto has been questioned; in any event, they are of seemingly recent origin. Only in *A. Curtissii* and *A. Biscayneanum* do we possess clearly distinct and established endemic species. It would be surprising if a flora isolated since Tertiary times had not assumed more unique aspects than the Florida fern flora has.

The fern floras of tropical Florida and of the northern peninsular lime-sink region are separated by many miles of marshes, prairies, and swamps. Species inhabiting such sites extend throughout the peninsula. The marked climatic difference between these two limestone areas, one tropical and the other south-temperate, is sufficient to account for most of the difference in the respective floras. The presence of seven Caribbean species in the northern region and their absence in the southern may be either due to accidental extinction from the southern habitats which are small in extent and few in number, migration from the West Indies directly to the northern section, or the failure of these species to cross the inhospitable barrier of central Florida, following migration into northern Florida around the Gulf of Mexico.

The fact that the Florida fern flora is West Indian, however, and that, except for ferns of general distribution in the American tropics, no species are common to both Florida and Mexico, suggests that the latter hypothesis is improbable.

Recent collections have shown that the subtropical ferns of the northern region are not so rare as formerly supposed. The author examined several hundred lime formations and found at least some of these species growing on the large majority. Rapid solution of the

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[17] Robert T. Clausen: Ophioglossum petiolatum Hooker. Amer. Fern Journ. 28: 1–11. 1938.

porous limestones (Ocala, Tampa, Hawthorn Formation) near the surface has led to the creation of many favorable habitats. Due to the nearly constant ground-water temperature, updrafts are created in sinks and cave-openings when the surface air temperature is low, a phenomenon which is admirably suited to the dispersal of fern spores. Peculiarities in distribution are correlated with the existence and locations of suitable habitats. The subtropical species of this region thus appear to be well adjusted to the actual climatic and physiographic conditions.

The subtropical fern flora of Florida, therefore, does not appear to be a relict one originating in Tertiary times, existing precariously since the ice ages despite an unfavorable climate, and thence spreading southward from a center of distribution in an "Oligocene island" region. The flora, instead, is apparently a normal expanding one. The subtropical species largely composing it have very likely migrated into Florida or evolved there since the Pleistocene, and their distribution can be satisfactorily explained by present-day climatic and physiographic conditions.

HARVARD FOREST, PETERSHAM, MASS.

Asplenium adiantum-nigrum in Arizona[1]

EDGAR T. WHERRY

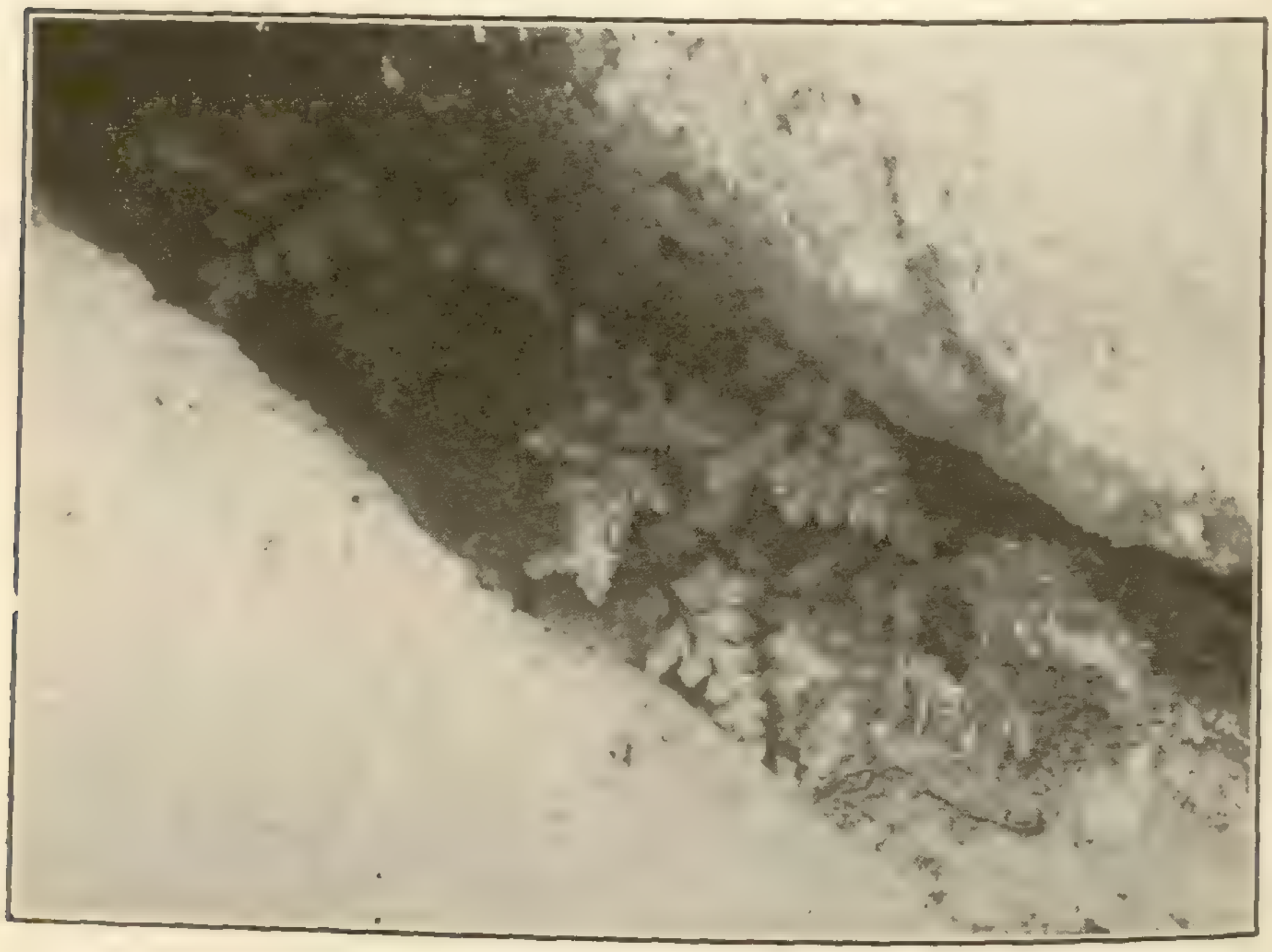
When discussing the occurrence of *Asplenium adiantum-nigrum* in Colorado three years ago, I mentioned[2] a report of this plant from northern Arizona, at that time unauthenticated. Subsequently, a specimen was deposited in the U. S. National Herbarium by Jack Whitehead, the discoverer of this occurrence. Mr. White-

[1] The field trip referred to in this article was supported by a grant from the American Philosophical Society.

[2] This JOURNAL 28: 128. 1938.

head advises me that, owing to the destruction of most of his specimens by fire, he does not plan to publish any account of the ferns of this locality.

On June 8, 1940, I visited the Museum of Northern Arizona near Flagstaff, and Mr. L. F. Brady, the geologist there, kindly offered to act as guide to the fern



ASPLENIUM ADIANTUM-NIGRUM L.

colony. We climbed about 500 feet above the plain over huge rocks, past viciously spined Opuntias and Yuccas, up the south face of Elden Mountain, four miles northeast of Flagstaff. Here the dacite rock formed great cliffs, in which there were occasional crevasses and cracks. In these various ferns could be seen, many of them out of reach, though a few were accessible to a sufficiently agile collector. And among them was the Black-hair Spleenwort.

Though widespread and common in many parts of the world, this fern is for some mysterious reason very rare

in the United States. There is one record from Florida[3] —in my opinion not above suspicion as to representing a specimen from Europe, received in exchange. An occurrence of it in Colorado was first brought to attention under the name *A. Andrewsii*,[4] later assigned to its proper place by Maxon.[5] In 1937 Mr. Andrews showed me that locality, but all that remained of the fern was far above our heads and inaccessible. Then it was found in Zion Canyon, Utah;[6] but on visiting that National Park in 1940, I was unable to find anyone who knew on which of the myriad cliffs it occurs.

At the Arizona station it is not abundant, and is mostly high on overhanging cliffs. Nevertheless, by balancing the camera tripod on some large boulders and giving a 10-minute exposure I was able to obtain a photograph of one clump. This is here reproduced (Fig. 1.) A few fronds, for a specimen, were pried loose with the aid of a stick. Most of the plants being wholly out of reach, this is one colony of a rare fern not likely to be destroyed by vandalism.

Other ferns noted on the same cliffs in the few minutes available for exploration were:

ASPLENIUM SEPTENTRIONALE. A single small clump, representing a slight southward extension of its previously known range.

ASPLENIUM TRICHOMANES. Plants rather small, but unexpectedly abundant in a station this far south.

CHEILANTHES WOOTONI. Several clumps of this very scaly fern were seen in a single crevice.

DRYOPTERIS FILIX-MAS. A few very young plants in an especially moist spot.

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[3] D. S. Correll, This JOURNAL 28: 49. 1938.
[4] Aven Nelson, Proc. Biol. Soc. Washington 17: 174. 1904.
[5] W. R. Maxon, Contr. U. S. Nat. Herb. 16: 1. 1912.
[6] Cottam, Garrett & Harrison, Bull. Univ. Utah 30, No. 16: 3. 1940.

PELLAEA SP. Out of reach.

WOODSIA SP. A small, glandular cliff-fern, seen only in a few poorly developed clumps.

The cliffs of Elden Mountain can certainly be recommended as worthy of a visit by any fern enthusiasts who get into northern Arizona.

PHILADELPHIA, PENNSYLVANIA

Beware of "Lycopodium"!

CHARLES WHITEBREAD

From the beginning of recorded time the minute spores of *Lycopodium clavatum* (and other species), known to the early botanists as *Muscus terrestris* or *Muscus clavatus*,[1] have been recommended for their therapeutic virtues. This plant, a common club-moss, is found throughout central and northern Europe, most of North and South America, continental Asia, the East Indies, and even in Africa, being in fact so widely distributed as to have led naturally to its therapeutic use in common life in many parts of the world. It was frequently used in domestic therapy as an application to fresh wounds, and earned a reputation as an absorbent styptic. Notwithstanding its rather wide use in pharmacy in the middle of the 17th century, English druggists seem not to have included the powder in their lists of drugs before 1692, and it was not "official" in any of the London pharmacopoeias. It was introduced in the U. S. Pharmacopoeia of 1860, and has been included in all succeeding editions.

A large part of this drug, "Lycopodium" of the U. S. Pharmacopoeia, is gathered in Russia and Poland, and

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[1] Flückiger and Hanbury: Pharmacographia, A History of Drugs, pp. 731–733. 1879.

most shipments to this country come by way of Danzig, Hamburg, and London. In a pure condition it is composed of nearly 50 per cent fatty oil, mainly olein with small amounts of phytosterin, and traces of the glycerides of arachitic, palmitic, and stearic acids; a distinctive acid (lycopodic acid) has been reported in the oil to the extent of about 2 per cent.[2,3] Frequently it is adulterated with such substances as slightly roasted and colored starch, dextrin, powdered colophony, talc, and various pollens.

"Lycopodium" is an ingredient of dusting powder used on physicians' rubber gloves, but its use in this manner has been shown to be dangerous. In 1933[4] five cases were reported in which the spores of *Lycopodium*, having been introduced into the operative field in the course of surgical procedure, acted as foreign bodies and gave rise to indolent chronic postoperative inflammatory reactions at the original operative site, necessitating secondary operations at subsequent dates. In 1935[5] six similar cases were reported. In these it was shown that the spores either impeded the abatement of the existing condition or gave rise to additional complicating factors. The use of *Lycopodium* spores on gloves or operating implements was cautioned against, and this substance has been largely replaced by other dusting powders.

The chief employment of this drug in modern pharmacy has been as a dusting power for suppositories, to facilitate the rolling of pilular masses, and to prevent the adhesion of pills and suppositories when formed. These uses also have been reported to be dangerous, how-

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[2] John Uri Lloyd: Origin and History of All the Pharmacopoeial Drugs, The Caxton Press, Cincinnati, 1921.

[3] Wood and LaWall: United States Dispensatory, 22d edition, J. B. Lippincott Company, 1937.

[4] William Antopol: Lycopodium Granuloma, Arch. Path. 16: 326. Sept. 1933.

[5] I. H. Erb: Surg. Gynec. & Obst. 60: 40. Jan. 1935.

ever, if the medicine comes in contact with an open wound. In 1937[6] the history of the development of a rectal granuloma was traced to a continued use of suppositories. Further investigation disclosed that the pharmacist who made the suppositories used the spores of *Lycopodium* for dusting, in order to prevent adhesion to the wrapper. When the possibility of the introduction of the spores was precluded, the wound healed and there was no need for further operations.

"Lycopodium" is not wetted by water but floats upon it, and when thrown into a flame it burns with a quick flash. This latter characteristic has resulted in its commercial use in large quantities, in connection with shellac and earthy salts to make different colored signal fires, as well as colored fireworks for evening celebrations. It is well known how dangerous fireworks are and that numerous accidents come about through their careless use. In addition to the objectionable qualities referred to, the alkaloids of this drug have been proven to be harmful to warm-blooded animals.[7]

Taking everything into consideration, this seemingly harmless substance should be regarded as a pretty bad actor! So, under the circumstances of its known dangerous qualities and its continued improper use, in spite of warnings in the literature,[8,9] this further admonition to "Beware of Lycopodium!" may not be considered untimely.

DIVISION OF MEDICINE AND PUBLIC HEALTH,
U. S. NATIONAL MUSEUM.

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[6] William Antopol and Charles Robbins: Lycopodium Granuloma Resulting from Anal Suppositories. Journ. Amer. Med. Assoc. **109**: 1192. Oct. 9, 1937.

[7] Contribution to the Study of the Toxicity of Alkaloids of Lycopodium. Journ. Amer. Pharm. Assoc. **27**: 330. July, 1938.

[8] E. J. McCormick and T. L. Ramsey: Journ. Amer. Med. Assoc. **116**: 817–821. March 1, 1941.

[9] Science **93**, Suppl.: 10. March 28, 1941.

Notes on Dominica Ferns

W. H. HODGE

The appearance in 1929 of Domin's Pteridophyta of the Island of Dominica represents the first publication on the flora of this botanically rich Lesser Antillean island. That the ferns should be first treated is logical, for with nearly 400 species this great plant group is dominant on rain-drenched, mountainous Dominica. During the past four years the writer has spent intermittent periods collecting on Dominica with the anticipation of finally publishing a flora of the island. As a result of these investigations 23 species of ferns are here added to the known list presented in Domin's work. Future additions will undoubtedly be made, for many pteridophyte species still unknown on Dominica are common to the two French islands Guadeloupe and Martinique, which lie close to the British island on the north and on the south.

For kind assistance in certain critical groups I am indebted to Dr. William R. Maxon and Mr. C. V. Morton, of the U. S. National Herbarium, and I am especially indebted to Mr. C. A. Weatherby, who has checked all my fern determinations. Unless otherwise stated, all collection numbers cited in the following list are my own.

OPHIOGLOSSUM RETICULATUM L. This species, distributed generally through the West Indies and Tropical America, may now be recorded from Dominica. Specimens were collected from a small colony growing beneath orange trees at Fern Villa, Ridgefield Estate, ca. 400 m., no. 2192.

ELAPHOGLOSSUM GLABELLUM J. Smith. The first Dominica record for this species, which has been collected on Martinique only in the Lesser Antilles, but is widely

distributed in the Greater Antilles and South America. Epiphytic, on cleared areas at Sylvania estate, 625 m., no. 1155; forest borders, Syndicate Plantations, 700 m., no. 2623.

ELAPHOGLOSSUM HERMINIERI (Bory & Fée) Moore. Known from a single collection. Epiphytic on a tree fallen across feeder stream, Pegoua River near Deux Branches, Concorde Valley, 100 m., no. 3112.

ELAPHOGLOSSUM HYBRIDUM Bory. First record for Dominica; epiphyte, middle forested slopes of Morne Anglais, ca. 900 m., no. 17A.

ELAPHOGLOSSUM LLOYDII Underwood. Domin (p. 106, *pl. 20, fig. 2*) lists this as new, but without description, stating that it is "a distinct endemic species." He cites a Nicholls specimen collected in 1891, identified by Baker as *Acrostichum undulatum;* also *Francis E. Lloyd* no. 863 (type), from Morne Diablotin, 1903. Apparently Underwood never published this name. I have examined material bearing the type collection number, also *Lloyd* no. 321, in the herbarium of the New York Botanic Garden, and am unable to separate *E. Lloydii* from *E. Boryanum* (Fée) Moore, a species well known in Dominica and other of the Lesser Antilles.

ELAPHOGLOSSUM MAXONII Underwood. According to Maxon the first record for the Lesser Antilles, this species having been known up to now only from the Greater Antilles. Its relationship has been discussed fully by Morton.[1] Growing in full sun on a mossy stump in the middle of a grapefruit orchard, Sylvania, 600 m., no. 1302.

ELAPHOGLOSSUM RIGIDUM (Aubl.) Urban. According to Alston, who has seen the type, *E. flaccidum* of authors must fall into synonymy with this species. A single

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[1] This JOURNAL 29: 12. 1939.

collection is known from Dominica: Epiphytic in mossy forests near summit of Morne Anglais, 1000 m., no. 2303.

ELAPHOGLOSSUM SCOLOPENDRIFOLIUM (Raddi) J. Smith. This species is uncommon in the West Indies, the only other Lesser Antillean station known being Guadeloupe. The Dominica specimens (sterile), growing as epiphytes, were collected in a shaded gorge near the base of Massacre River Falls, 500 m., vicinity of Sylvania, no. 1021.

POLYPODIUM FLABELLIFORME Poir. This West Indian species was recorded by Grisebach from Dominica on the basis of an Imray specimen, but Domin could not find it at Kew. A new collection will thus authenticate this earlier record, up to now questionable. Epiphytic in mossy forests at the summit of Morne Trois Pitons, 1500 m., no. 1438.

POLYPODIUM GLAUCOPHYLLUM Kunze. A single collection represents this species, which is rare in Dominica. This fern, with fronds glaucous beneath, is an epiphyte, clambering by means of its greenish rhizomes over tree trunks in high-stem mountain forests, Morne Colla Anglais, 650 m., near Sylvania, no. 1181.

POLYPODIUM **Knowltoniorum,** sp. nov., epiphyticum: frondibus pluribus vel crebris, laxe fasciculatis, adscendentibus, saepe arcuatis vel laxis; rhizomate erecto, apice dense paleaceo, paleis pallide fulvis lucidis lineari-oblongis vel lanceolatis acuminatis integris vel hinc inde sparse irregulariter saepe retrorse denticulatis, dentibus e cellulis paucis; stipite brevissimo; lamina lineari apice vix angustiore, tertia parte basali attenuata oblique pinnatifida prope ad rhachem, utrinque longe setosa, setis patulis rufo-brunneis; segmentis monosoris propinquis oblongis vel deltoideis saepe margine superiore gibbosis, apice rotundatis minute crenulatis, basi decurrente anguste conjunctis, segmentorum sterilium et fertilium venis prope basem semel furcatis, venis brevioribus superioribus ad apicem soriferis; sporangiis glabris. (*Pl. 1, figs. 4–6.*)

Plants epiphytic, the *fronds* several to numerous, loosely fasciculate, ascending, often arcuate or lax, 5–13 cm. long. *Rhizomes* erect, 0.8–1.8 cm. long, 1.5–3 mm. in diameter, densely paleaceous at the tip, the *scales* light fulvous, lustrous, linear-oblong to lanceolate, acuminate, 2.4–4.5 mm. long, 0.4–1.4 mm. broad (cells large, oblong to linear-oblong, with thin, mostly oblique, concolorous partition walls), entire or with occasional few-celled, often retrorse, marginal processes; *stipe* almost wanting, 1–3 mm. long, terete, dark; *lamina* linear, 5–14 cm. long, 6–13 mm. broad, obliquely pinnatifid almost to the rhachis, scarcely narrowed at the roundish lobate apex, gradually attenuate in the basal third, the *lower segments* gradually smaller, longer-decurrent, invariably terminating in a rather broad but short foliaceous wing; *rhachis* dark, generally immersed, the whole lamina conspicuously long-setose on both surfaces with spreading reddish-brown hairs, about 1–2 mm. long; *segments* monosorous, 15–35 pairs, rather close, oblong to triangular, often gibbous on the upper margin, with rounded to minutely crenulate apex, narrowly joined at the decurrent base; *veins* of the sterile and fertile segments once forked near the base, the main vein (2–3 mm. long) and upper lateral spur (1–1.5 mm. long) each terminating in a minute, elliptical hydathode, distant about 0.8 mm. from the segment margin and usually apparent on the upper surface of the frond; lateral branch-veins soriferous at or just below the hydathode; *sori* large (about 1.6 mm. in diameter) round, partially concealing the rhachis; *sporangia* glabrous, the annulus 14-celled; *leaf tissue* pale green, herbaceous, translucent.

Epiphytes in mossy forests, at high elevations, Lesser Antilles. I have seen the following specimens. GUADELOUPE: Massif Central, 800 m., *Questel*, no. 1033 (sheet no. 1,780,525 in U. S. Nat. Herb.). DOMINICA: Locally common in association with *P. asplenifolium*, *P. tenuiculum*, *P. Hartii*, *P. jubaeforme*, *P. taenifolium*, and *P. serricula*, in wet moss mats on the limbs of stunted trees in the mossy forest zone covering the summit of Morne Trois Pitons, 1400 m. altitude, ca. 1000 cm. rainfall, August 15, 1938, *Hodge*, no. 54 (type in Herb. Gray; isotypes in U. S. Nat. Herb. and Herb. N. Y. Bot. Gard.);

same locality, Feb. 23, 1940, *W. H. & B. T. Hodge,* nos. 1404 and 1431 (1404 and 1431 in Herb. Gray; 1431 in Herb. N. Y. Bot. Gard. and U. S. Nat. Herb.).

Polypodium Knowltoniorum is here proposed as an addition to the small subgroup of species consisting of *P. basiattenuatum, P. Sherringii, P. serricula,* and *P. trichomanoides,* these belonging to the Tropical American group of about 25 species long ago discussed by Maxon.[2] As in its four relatives the blades are long-setose with reddish hairs and the rhizome scales are non-ciliate, bearing instead occasional irregular teeth 1 to 3 cells broad. *Polypodium basiattenuatum* is confined to the high mountains of Jamaica; *P. Sherringii,* a very rare species, is known only from Jamaica and Cuba; and *P. trichomanoides,* an abundant epiphyte in the Blue Mountains of Jamaica, is represented also by a few specimens from Cuba, Guatemala, and Honduras. The other two, *P. serricula* and the new species here described, are Lesser Antillean.

In 1938, in Dominica, the writer collected about a dozen specimens (no. 54) representing *P. Knowltoniorum.* A return trip in 1940 added much additional material, some 150 specimens, all from the type locality—mossy forests atop Morne Trois Pitons. At the same time, at the same locality, and growing intermixed with the new species under identical ecological conditions, there was also collected (no. 3963) a comparable numerical series of *P. serricula* (Plant. Exsicc. Gray. no. 1007).

Study has shown that these two species are very closely related. At first, I strongly considered treating the new entity as a variety of *P. serricula;* but since no intermediate forms are present and the two series are quickly separable even by the eye, it seems proper to propose a new species.

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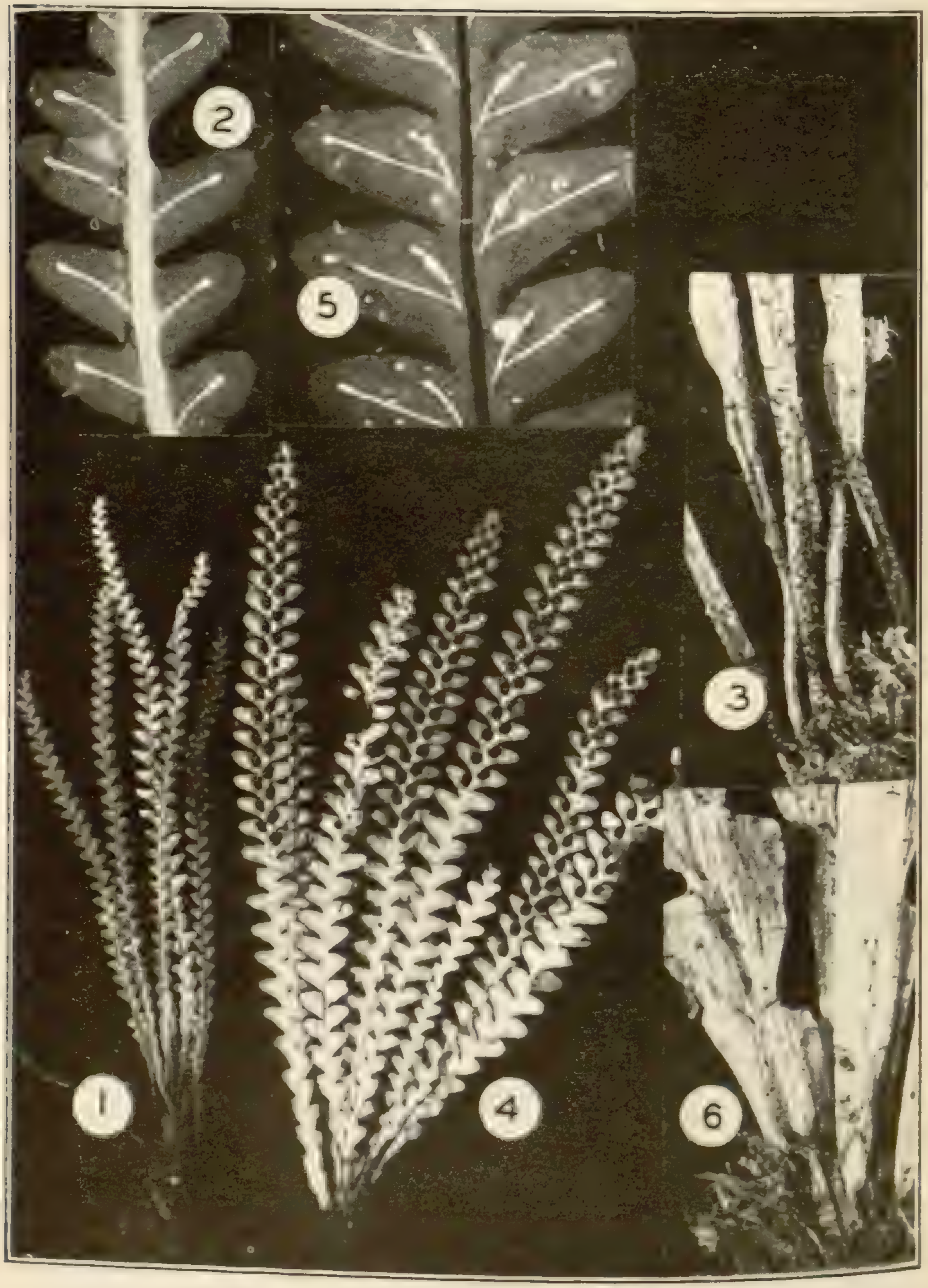
[2] Contr. U. S. Nat. Herb. 17: 542–557. *pls. 32–38.* 1916.



POLYPODIUM SERRICULA AND P. KNOWLTONIORUM.

From *P. serricula*, *P. Knowltoniorum* can be distinguished chiefly by its lack of a visible hairy stipe and by the unvarying presence of branched veins in all mature sterile segments, *P. serricula* possessing a distinct and often long, hairy stipe, as well as simple veins in all sterile segments. Average fronds of *P. Knowltoniorum* are also broader (over 6 mm. wide), laxer, and with oblong-rounded segments, often distinctly gibbous. This gibbosity is correlated with the presence of the long-produced, lateral spur-vein, at whose tip the sori are always borne.

Gibbous segments are the rule in *P. trichomanoides*, but *P. Knowltoniorum* differs in having broad, lax, translucent fronds, with definitely winged stipes. The "stiffly erect or shuttlecock habit of the very numerous rigid fronds" seen in *P. trichomanoides* is absent in *P. Knowltoniorum*.

A single, poor specimen (*Questel*, no. 1033) is the sole record for *P. Knowltoniorum* in Guadeloupe. This collection was very doubtfully annotated by Maxon as *P. trichomanoides*, but on an accompanying label he states, "This is more closely related to *P. serricula*, but it is larger and bears the sorus of the segment upon an elongate basal vein branch." The Questel specimen is abnormal in one respect—its stipes are narrowly alate, rather than broadly so. This condition, which occurs in several of my Dominica plants, is due to "smothering" by too many overlying mosses, through which the individuals have had to push their fronds.

It is a pleasure to name this species after the John E. Knowltons, of Sylvania, Dominica, whose friendly and helpful hospitality alone made possible our collecting trips to Trois Pitons.

The following key, revised from Maxon, may be used to separate *P. trichomanoides* and its closest relatives:

Fertile branch of vein usually long-produced; segments generally gibbous.
Fronds numerous, with stiffy erect or shuttlecock habit; segments narrow, almost coriaceous; stipe definitely non-alate ..... **P. trichomanoides**
Fronds less numerous, laxly arcuate; segments broad, translucent; stipe alate to the base ..... **P. Knowltoniorum**
Fertile branch of vein short or (in *P. serricula*) commonly obsolete, the sorus then subsessile; segments never (rarely in *P. serricula*) gibbous.
Segments obliquely triangular or deltoid-oblong ..... **P. serricula**
Segments oblong, rounded at the apex.
Lamina delicately herbaceous, copiously long-setose; vein of fertile segments distinctly geniculate .... **P. basiattenuatum**
Lamina more or less spongiose, sparingly setose, the hairs shorter; vein of fertile segments arcuate, decurved.
P. Sherringii

POLYPODIUM LIMBATUM (Fée) Maxon. Exceedingly rare, this species has until now been known only from Guadeloupe and St. Vincent. Its small size and its habit of growing epiphytically with mosses on inaccessible peaks make it easily overlooked. Known from a single specimen, from mossy forests atop Morne Trois Pitons, 1500 m., no. 1437.

POLYPODIUM REPENS Aubl. Although known from the Greater Antilles this species is apparently very uncommon in the Lesser Antilles, the only collections that I have seen being from Guadeloupe. In Dominica it was collected but once,—clambering upon large trees in a densely forested ravine near the northwest base of Morne Diablotin, 800 m., no. 2782.

POLYPODIUM SERRICULA Fée. (*Pl. 1, figs. 1–3.*) The accumulation of much additional material of this species —chiefly by Stehlé in Martinique and Guadeloupe, Questel in Guadeloupe, and by the writer in Dominica—makes necessary a reconsideration of its delimiting characters. The differences by which Maxon separated it from *P. trichomanoides* still hold, with one exception, i.e. segments "never gibbous," a character which was used in his key. Gibbosity is not the rule in this species, yet certain recent specimens from Guadeloupe (*Stehlé,* nos.

656, 1768, 1771, 1772, 1781; *Seifriz*, no. 37; all in U. S. Nat. Herb.) and from Dominica (*Hodge*, nos. 58, 2792, 3963 [Plantae Exsicc. Gray. no. 1007] in part, all in Herb. Gray) do show a pronounced swelling on the superior margin of some segments. Such segments are always fertile and possess two hydathodes, the extra one representing the tip of a short soriferous spur-vein, which normally is suppressed in this species. Despite this gibbous tendency *P. serricula* is still readily separated from *P. trichomanoides*, but is more likely to be confused with *P. Knowltoniorum*.

POLYPODIUM TENUICULUM Fée. It is remarkable that this Lesser Antillean species has been unrecorded from the island, for at middle to higher elevations it is quite common as an epiphyte on trunks of large forest trees. Perhaps it has been overlooked because it is associated with *P. asplenifolium* and *P. jubaeforme*, which at a distance it somewhat resembles. I have collected *P. tenuiculum* at Sylvania, 600 m., nos. 1118 and 3960; in rainforests along the trail to Castle Bruce, 700 m., no. 1227; in mossy forests near the summit of Morne Trois Pitons, 1500 m., no. 1433; and near the Syndicate Orchards at the northwestern base of Morne Diablotin, 700 m., no. 2619. In addition, I have seen *Cooper* no. 102 (in U. S. Nat. Herb.) from Sylvania.

PITYROGRAMMA SCHAFFNERI (Fée) Weatherby. The first Dominica record for this species is a small form from Red Gully, 500 m., on the Imperial Road between Mt. Joy and Sylvania, no. 1290.

(To be concluded)

PLATE 1.—POLYPODIUM SERRICULA Fée: Fig. 1, $\times \frac{3}{4}$; fig. 2, venation of sterile segments, $\times 5$; fig. 3, stipes, $\times 5$; *Hodge* no. 3963. POLYPODIUM KNOWLTONIORUM W. H. Hodge: Fig. 4, $\times \frac{3}{4}$; fig. 5, venation of sterile segments, $\times 5$; fig. 6, stipes, $\times 5$; the type specimen, in part.

Shorter Notes

PTERIS MULTIFIDA IN ARKANSAS.—On April 19, 1941, I found the Huguenot Fern (*Pteris multifida*) at Hot Springs, Garland County, Arkansas, and have given small specimens to the Missouri Botanical Garden, the Field Museum, and the U. S. National Museum, besides adding two to my own collection, all under my no. 4141. They were collected at a point about 100 feet west of the hot springs, at the base of Hot Spring Mountain, and at the back of the little park west of the bath houses. A colony of six or eight plants here clings to the vertical sides of a limestone tufa niche, facing north, in complete shade, under a curtain of honeysuckle vines falling from a shoulder above. Each plant sinks its roots into a tiny fissure, its leaves lying against the rock surface. One small plant of *Adiantum capillus-veneris* was growing in the same niche. I was looking for *Cheilanthes alabamensis*, and combed the area everywhere for an unrolling specimen. I failed to find the *Cheilanthes*, though Dr. F. J. Scully kindly pointed out his station for that, perhaps 50 feet above where I found the *Pteris*.—ALBERT CHANDLER, *St. Louis, Mo.*

BRACKEN AS A SOURCE OF PAPER IN BRITAIN.—*Science*, April 18, 1941, reports that experiments are in progress in Britain on the use of Bracken fronds (*Pteridium aquilinum*) in paper-making. The European variety is a very common and troublesome weed in pastures and old fields. According to Long and Fenton (Journ. Roy. Agric. Soc. Eng. **99**, 1938) the present wide distribution was largely acquired during the last war, when many of the large estates could not be properly tended. It will be interesting if one of the liabilities incurred during the last war can be turned to advantage in this one!—R. M. TRYON, JR., *Gray Herbarium.*

MORE FLORIDA FERNS.—In mid-April of this year I went on a collecting trip to a point called Prospect Landing—probably an ancient ferry landing on the banks of the St. Mary's River—in Nassau County, Florida. Just off the dirt road leading to the river, and about a half-mile from it, is a deep ravine, which I proceeded to explore for the first time, although I had previously been over much of the surrounding territory. A clear small stream drains the ravine and runs down into the river, and on its low step banks, for less than a hudred yards, were fine specimens of *Polystichum acrostichoides.* This is the first time I have seen this fern in northeastern Florida. For miles along the river there are large colonies of *Selaginella apoda,* the plants lying closely appressed to the steep banks of the river and covering logs and tree roots in the adjacent swamp. The only other place I know this species is the center of a swamp in the extreme southern part of Duval County, about 75 miles south of the St. Mary's River.

The day following my St. Mary's River trip I went south to Middleburg, Clay County, and a few miles north of Middleburg paused to collect some *Iris.* I had stopped at this particular spot several times previously, but this time, struck by the color range of a clump of *Iris* in the distance, I went farther back from the road than before and came on a considerable colony of *Isoetes,* a hundred fine plants or more, which proved to be *I. Engelmannii.* This species had never been collected in Florida until last year, when I found a single plant growing on the bank of a stream near my home. I have since searched both banks for a long distance, but have not been able to find any more. This is not surprising, as a WPA project cut the stream about three feet lower than it originally was and somehow, through no fault of theirs, managed to leave one plant alive. As I have now located this species

of *Isoetes* in two different counties, it may be expected to occur at other points in Florida.—MARY W. DIDDELL, *Jacksonville, Fla.*

PROTECTIVE FERN MOUNTS.—Mr. Howard Gilmore has sent us a sample of a method of mounting which he has devised and which some of our members might like to try, especially for specimens which are to be used for exhibition.

Materials needed are: stiff white cardboard about $\frac{1}{12}$ inch thick; Kodak dry mounting tissue; cellophane; and binding tape (Dennison's no. 4 gummed cloth mending tape is good). Lay the cardboard (which can be cut to any size to accommodate the specimens) on a smooth surface, place on it a sheet of mounting tissue of the same size, tack this down by touching it at several points along the margin with a hot electric iron, arrange the specimens upon it, tacking them lightly in place, cover with a sheet of cellophane, lay a piece of thin flannel over it, and iron the whole with a hot electric iron (but not so hot as for ironing clothes), working from the center outward. Finish the edges with a binding tape after the manner of a passepartout. More specimens may be mounted on the other side, if desired, and labels and photographs or drawings may be put in with the specimens. Fruiting fronds should be lightly varnished with banana oil before mounting, to keep the sporangia in place.

The result is a rigid mount which shows the specimens well and will stand much rough handling without damage. Mr. Gilmore, whose address is 97 Holland Road, Brookline, Mass., will be glad to answer questions in regard to his process.—C. A. WEATHERBY, *Gray Herbarium.*

Recent Literature

"Horticulture" for March 1, 1941, has an unsigned article on fern-growing as a garden hobby. It contains useful comment on the proper place and treatment of ferns in the garden, suitable species for different locations, and the securing of stock from the wild without depleting the native supply. The statement that the fertile fronds of Lady-fern are now being used in winter bouquets is news to us.—C. A. W.

The fern flora of the Channel Islands, California (San Clemente, Santa Catalina, Santa Rosa, and Santa Cruz) has recently been listed by M. B. Dunkle.[1] There are no endemic species, the majority being of general mainland distribution. Twenty species and varieties are enumerated, all belinging to the Polypodiaceae. The fern reported as *Notholaena candida* Hook. is *N. californica* D. C. Eaton. According to the author this species is known on the Channel Islands only from Santa Cruz, but in the National Herbarium there are specimens also from Santa Catalina Island, these collected by Blanche Trask in February 1897 and March 1899.—C. V. M.

Our Chilean member, Mr. Looser, continues his excellent work on the ferns of his country. In addition to the articles enumerated in Dr. Benedict's recent review, he has lately published two short papers. One gives an account, with a key, descriptions, citation of specimens, discussion and illustrations, of the four species of *Elaphoglossum* known in Chile. One of these, *E. Lindenii*, occurs in Chilean territory only in the islands of Juan Fernandez; the other three, *E. Gayanum*, *E. Mathewsii*, and *E. Porteri*, are rather rare rock-inhabiting ferns of

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[1] "Ferns of the Channel Islands," Bull. So. Calif. Acad. Sci. 39: 2–5. 1940.

south-central Chile. Here they are at the southernmost limit of the genus and separated by a considerable distance from their congeners and even from the other regions in which two of them are to be found. There are no Elaphoglossums in northern Chile. Only *E. Porteri*, however, is endemic; *E. Gayanum* occurs in Argentina and *E. Mathewsii* along the Andes.

The second paper discusses the finding, by Donat, of the Andean *Asplenium triphyllum* Presl in southern Patagonia.[1]—C. A. W.

One of the earliest members of the American Fern Society, when it was still known as the Linnaean Fern Chapter, and one of the first to contribute toward publication of fern data under the auspices of the Chapter, Dr. A. J. Grout has continued his interest in ferns and the Fern Society, among other activities having been host at a field meeting of members at his summer home in Newfane, Vermont. During this long period his major interest, however, has been with mosses, and he is noted for a succession of publications on this group of plants. His "Mosses with Hand Lens and Microscope" has for many years served as an admirable introduction to moss study, and as editor of the Bryologist, which had its beginning as a section of the Fern Bulletin, he has contributed widely to the field of bryology.

With the recent publication of Vol. 2, part 4, of "Moss Flora of North America north of Mexico" Dr. Grout has brought to completion, in three thick volumes, his most ambitious and comprehensive published work on mosses. This beautifully illustrated treatise of nearly a thousand pages will, of course, be an essential in any botanical or

---

[1] Looser, Gualterio. El Género "Elaphoglossum" Schott (Filices) en Chile. Asplenium triphyllum Presl en la Patagonia Austral. Anais Primeira Reunião Sul-Americana de Botanica 3: 399–410. 5 pls. 1940.

general reference library. It will be of special interest and value to many members of the Fern Society, both to those who have already begun the study of mosses and to others who may wish to begin an excursion in the knowledge of these plants, which are almost invariable companions of ferns. In general, it may be noted that a thorough-going study of mosses calls for the use of a compound microscope and the discrimination of cellular differences in the structure of the leaves, the peristome teeth, and other minute parts.—R. C. B.

The three species of *Isoetes* growing in San Diego County, California, have recently been thoroughly studied by Mr. Louis C. Erickson.[1] Two of these, *I. Nuttallii* and *I. Orcuttii*, are rather closely related, and were considered doubtfully distinct by Miss Pfeiffer, the monographer of this genus. Mr. Erickson finds, however, that there are morphological differences between the two, as well as differences in habitat. *Isoetes Nuttallii* grows along small streams, but not in standing water, although the plants may be partially submerged after rains; its soil preference is for a coarse sand or sandy clay. On the other hand, *I. Orcuttii* grows only in vernal pools, and is submerged during most of the growing season. After the water evaporates the plants mature in the desiccating soil. In all instances the soil is pure clay, which is soft when wet and extremely hard when dry. The third species, *I. Howellii*, is less limited in habitat, growing either in pools or on stream banks, sometimes in the shade of chaparral plants. In this species the range in size of the megaspores is very great, and the author considers that the var. *minima* Pfeiffer has no morphological basis.—C. V. M.

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[1] Erickson, Louis C. A Study of Isoetes in San Diego County, California. Madroño 6: 7–11. 1941.

Mr. Albert Chandler, vice-president of the St. Louis Horticultural Society, has published a list of the true ferns of Missouri, with pleasantly written preliminary comment.[1] This contains interesting bits of information. Purple Cliff-brake, for instance, does well in the moist warmth of a Wardian case; in Missouri, Hay-scented Fern grows only on wet, shaded sandstone ledges. Mr. Chandler's language is often picturesque and imaginative. He likens the lower pinnae of the Purple Cliff-brake to the "sword-handle cross of the crusaders," and sees the fruiting spike of *Ophioglossum Engelmanni* as "two rounded ridges, like a double-barrelled shotgun." It is sad to find him a victim of the insidious fascination of punning and, like many other good man, led astray thereby. His one attempted pun, on Fée (the French pteridologist) and fee, rests, alas, on a misspelling and a mispronunciation!—C. A. W.

American Fern Society

MEMBERSHIP CAMPAIGN.—A folder of information about the Fern Society and the JOURNAL is ready for distribution by the Membership Committee. With this organization work out of the way it is hoped that a large number of members will enlist with Mr. W. Herbert Dole, Chairman, obtain a supply of circulars by writing to the Brooklyn Botanic Garden, and distribute these to libraries, garden and nature clubs, and particularly to individuals who are likely to be interested in the Fern Society. It would be a fine thing if we could have special representatives of the Membership Committee in every state.

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[1] Chandler, A. The common Missouri Ferns. Garden Life, 14: 6–8. 1940.

BOOKS ON FERNS.—What fern book is best suited for my use? As a basis for answering this question, Dr. R. M. Tryon, Jr., is preparing a list of fern books, both general and regional. Copies of this will be available through the Librarian, Miss Hester M. Rusk, who will also furnish printed lists of all the books available on loan to members. In this connection an appeal is made to members for reprints of any fern articles, extra copies of older numbers of the JOURNAL, and duplicate fern books, as a contribution to the Society.

FIELD TRIPS TO FERN GARDENS.—Have you a fern garden or a fern corner which you would be willing to show to others? If so, the Membership Committee will appreciate hearing from you. We hope to draw up a full list of such gardens, which may serve as goals for informal field trips and to which we may refer enquirers: New members who want advice about what species to plant and how to grow them; old members who would like to see what others are doing. Some gardens, like those of Mr. Dole and of Mr. and Mrs. Thurston, are meccas each year for many visitors.

As a start, a few gardens are listed below. Since this notice possibly will not reach you before the first of September, the time for visits to northern gardens is necessarily short; many species will be far past their prime by the middle of that month. For next year, we hope there may be available a good list of gardens, representative of all parts of the country. In the next JOURNAL we shall be glad to announce open dates for any fern gardens in Florida or other of the warmer states where winter visits may be feasible. (In this present list, if definite dates are not given, prospective visitors are requested to enquire in advance as to a convenient time for visits.)

Mr. Maurice Broun: September–November, Hawk Mountain Sanctuary, Berks Co., Pennsylvania; winter months, Vero Beach, Florida; summer months, Long Trail Lodge, Rutland, Vermont.

Mrs. W. W. Diddell, R. F. D. 5, Box 296a, Jacksonville, Florida.

Mr. W. Herbert Dole, 23 Overlook Ave., West Orange, New Jersey.

Mrs. C. P. Griffeth, 41 Lake View Park, Rochester, New York. (September 20 and 21, 1941.)

Dr. Everet G. Logue, Williamsport, Pennsylvania.

Mr. Harold Goddard Rugg, Hanover, New Hampshire. (September 22, 1941.)

Mrs. Charles Y. Tanger, 316 North President Ave., Lancaster, Pennsylvania.

Mr. and Mrs. Edw. D. Thurston, Jr., Sharon, Connecticut; road toward W. Cornwall. (September 15, 1941.)

Bowman's Wild Bird and Flower Preserve, Washington's Crossing State Park, New Hope, Bucks Co., Pennsylvania (developed by Dr. Wherry).

R. C. B.

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A QUARTERLY DEVOTED TO FERNS

Published by the

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R. C. BENEDICT C. V. MORTON

IRA L. WIGGINS

CONTENTS

Notes on Dominica Ferns (conclusion) ..... W. H. Hodge 121
The Gold Rush: A Fern Ally ..... R. C. Benedict 127
State and Local Fern Floras of the United States (conclusion) ..... S. F. Blake 131
Habitats and Distribution of Ophioglossum in Florida ..... Edward P. St. John 143
Recent Fern Literature 148
American Fern Society 152
Index to Volume 31 157

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American Fern Journal

VOL. 31 OCTOBER–DECEMBER NO. 4

Notes on Dominica Ferns

W. H. HODGE

(*Conclusion*)

BOLBITIS NICOTIANAEFOLIA (SW.) Alston. This species was to be expected in Dominica, for it is known on each of the neighboring French islands. A single colony of some 50 plants or more was seen, but not a single fertile frond was present. Shaded ravine of a tributary of the Pegoua River, Concorde Valley, 200 m., no. 3130.

DRYOPTERIS QUADRANGULARIS (Fée) Alston. This was published in the Pteridophyta of St. Kitts[3] as a new combination to include the New World material of *D. dentata* (Forsk.) C. Chr. Alston apparently made this combination without having examined sufficient American material, for the characters used by him in separating *D. dentata* and *D. quadrangularis* completely break down. Dominica collections (16 numbers) of this complex alone show that *D. quadrangularis* cannot be upheld; for although no. 3459 from La Chaudière is typical *D. quadrangularis*, no. 2597 from Milton is typical of what Alston calls Old World *D. dentata*, and the majority of my numbers show various combinations of characters of both "species." To cite just a few: No. 1254, Imperial Road, has the lobation, slightly reduced lower pinnae, and long hairs of *D. quadrangularis*, with the rhachis and rhizome of *D. dentata;* no. 2877, Milton, has the slightly reduced pinnae and yellow rhachis of *D. quadrangularis*, with the lobation, hairs, and rhizome of *D. dentata;*

[3] Journ. Bot. 75: 253. 1937

[Volume 31, No. 3 of the JOURNAL, pages 81–120, plate 1, was issued August 18, 1941.]

no. 3490, Pegoua River Valley, has the slightly reduced pinnae, long hairs, and yellow rhachis of *D. quadrangularis*, with the lobation and rhizome of *D. dentata*. It seems best, from the evidence of such data, to abandon Alston's classification and to regard *D. dentata* as a highly variable species.

DRYOPTERIS DOMINICENSIS C. Chr. In his key to the subgenus *Lastrea*, Christensen separates this species, primarily on the basis of its scaly rhachis, from *D. rustica* (Fée) C. Chr. Careful examination of authentic material of *D. rustica* and comparison with a large series of Dominica material of *D. dominicensis* show that no essential differences exist. Maxon and Morton, in an unpublished key to Lesser Antillean species of *Lastrea*, have also reached this conclusion. Besides a collection, no. 2805, from Morne Diablotin, 1600 m., the type locality for *D. dominicensis*, I collected two numbers, nos. 137 and 1411, from mossy forests atop Morne Trois Pitons, a new locality for Dominica.

DRYOPTERIS HYDROPHILA Fée. As prophesied by Domin, this species of the French Antilles is now known from Dominica. The one collection, slightly divergent from typical material of *D. hydrophila*, was collected from wet banks along the trail near Freshwater Lake, alt. 665 m., rainfall 900 cm. per annum, no. 1857.

DRYOPTERIS GUADALUPENSIS (Fée) Kuntze. This Lesser Antillean species is now known in Dominica: Shaded ravine near the base of the twin falls of the Massacre River, 500 m., between Mt. Joy and Sylvania, no. 1373.

DRYOPTERIS SUBINCISA (Willd.) Urban. On page 226 of his Pteridophyta of Dominica Domin states that this species is as yet unknown to the island, although widespread in the West Indies and Tropical America. Yet in the same work (page 78) he cites a specimen (*Nicholls*, no. 242), identified by Baker as *Alsophila infesta*, which is "(teste Maxon)" *Dryopteris subincisa*. The writer

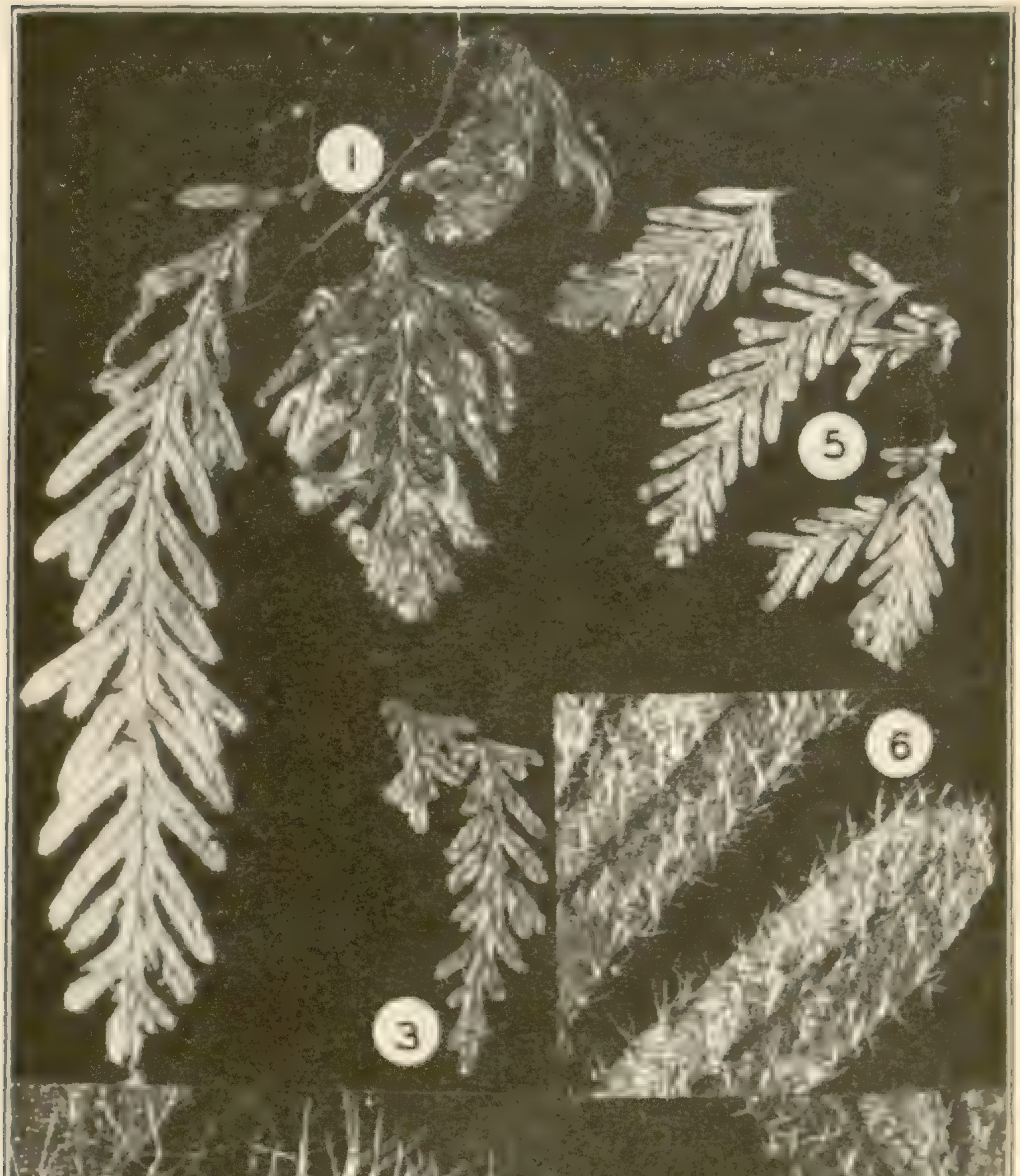
has also collected this large fern in the shaded ravine of the Massacre River, 500 m., between Mt. Joy and Sylvania, no. 1340.

SACCOLOMA INAEQUALE (Kunze) Mett. Citations by Krug of this large terrestrial species from Dominica are, according to Domin, founded on a misidentified specimen of *S. domingense* (Spreng.) Prantl. The writer has since made three authentic collections of *S. inaequale:* In rich forests at Laudat, 700 m., no. 1971; beside stream in shaded ravine, northwest base of Morne Diablotin, 750 m., no. 2784; shaded banks of Dublanc River near Milton, 600 m., no. 2864.

TRICHOMANES HYMENOIDES Hedw. Urban cites Dominica as a locality for this species, but bases his record on Grisebach, who does not list Dominica. The species is now known from woodlands about Lisdara, 600 m., where it occurs as an epiphyte, on shaded tree trunks, nos. 140 and 2372.

TRICHOMANES PUNCTATUM Poir. This species, common in the West Indies and Tropical America generally, is here recorded for the first time from Dominica. *T. sphenoides* Kunze is scarcely separable from *T. punctatum.* The latter is to be found in Dominica on shaded rocks or tree trunks: In ravine of Massacre River, 500 m., between Mt. Joy and Sylvania, no. 1017; shaded ravine, South Chiltern, 450 m., no. 1564; in rain-forests near Syndicate Orchards, 700 m., no. 2720; moist forests in valley of Pegoua River, 200 m., no. 3003; ravine of Gaulettre River, 100 m., Carib Reserve, no. 3355.

HYMENOPHYLLUM ECTOCARPON Fée. This rare species, until recently known only from Guadeloupe, is now recorded from Dominica. Comparative material has been unavailable, yet my specimens agree with Fée's description and plate, varying if at all in the more laciniate margins of the indusial valves. *H. ectocarpon* is a close relative of the widely distributed *H. fucoides* Sw. and



Hymenophyllum latifrons, H. hirsutum, and H. lanatum.

differs only in the deeply laciniate valves and in the distribution of the fructifications. Typical *H. fucoides* seldom possesses more than two sori per pinna and the number is usually limited to one, borne in axillary fashion on the first suppressed superior segment of the pinna. In Dominica material of *H. ectocarpon* the whole apical fourth of the frond may be fertile—the sori, four or five in number, occurring on unreduced, usually superior or apical segments. Future collections of *H. ectocarpon* may force its reduction to varietal status under *H. fucoides*, but for the present it seems best to consider it a valid species. All specimens collected in Dominica occur as epiphytes, on tree trunks in very deep shade: On trunk of *Hemitelia muricata*, Sylvania, 600 m., no. 1094; rain-forests near Syndicate Orchards, 700 m., no. 2899.

HYMENOPHYLLUM LATIFRONS van den Bosch. (*Pl. 2, figs. 1, 2.*) Nine years after the original description (1859) of this Lesser Antillean species, Hooker and Baker reduced it to a variety of the more widely distributed *H. hirsutum* (L.) Sw. Although Fée and Jenman both upheld van den Bosch's species, Christensen in the Index Filicum followed Hooker and Baker in considering it only of varietal rank. Originally recorded from Guadeloupe (*L'Herminier* and *Perrotet*), it has since been found on Dominica, Martinique, and St. Vincent. In the identification of his Dominica species of *Hymenophyllum* the writer has examined, in addition to his own material, that in the Gray Herbarium (G) and the herbaria of the U. S. National Museum (US) and the New York Botanical Garden (NY). As a result of this study he proposes that *H. latifrons* be considered a valid species.

Superficially *H. latifrons* resembles both *H. hirsutum* and *H. lanatum* Fée, but it differs from them in its wider segments (ca. 3 mm.) and broadly alate (ca. 3 mm.)

rhachises. The fronds also are slightly broader, and in no. 1412, representing plants growing under conditions of maximum rainfall (close to 900 cm. per annum) at the summit of Morne Trois Pitons, the frond-length (up to 19 cm.) is extreme. Under normal conditions fronds average between 5 and 10 cm. long. It was apparently on the basis of general similarity of frond that Hooker and Baker based their varietal reduction.

However, characters of vestiture differ, for although all three species possess stellate branched hairs, those of *H. latifrons* are consistently larger and definitely stalked. even in plants which in size may approach specimens of *H. hirsutum* and *H. lanatum*. In the material examined no intermediates between the type of hair characteristic of *H. latifrons* and those of the other two species have been seen. The hairs of *H. hirsutum* (*Pl. 2, figs. 3, 4*) are closely appressed, with four or more branches, and are practically sessile (when stalked they are usually limited to the indusial valves); further, they are evenly but lightly scattered over the whole frond-surface, and they vary in length from 0.2 to 0.6 mm. The vestiture of *H. lanatum* (*Pl. 2, figs. 5, 6*) is the heaviest of the trio, the hairs averaging from 0.4 to 0.6 mm. in length, generally with short stalks ca. 0.1 mm. long. The hairs of *H. latifrons* are never less than a millimeter in length and can be readily found up to 3 mm. long. The stalks of these tri-branched hairs average 0.6 mm. long, and thus commonly surpass the extreme total length of average hairs of *H. hirsutum* and *H. lanatum*. *H. latifrons* is the least hairy of the three species and the vestiture tends to be heaviest on the segment-margins.

The indusial valves also show disparity in size. Generally orbicular in all three species, they average 0.8 mm. in diameter in the two short-haired species, 1.4 mm. diameter in *H. latifrons*.

Hymenophyllum hirsutum and *H. lanatum* are pri-

marily Greater Antillean, whereas *H. latifrons* is a very rare species of the higher, rain-swept volcanic peaks of the Lesser Antilles, where it occurs as a pendant epiphyte in wet moss mats on trees or dripping rocky outcrops. *H. latifrons* is a strict hydrophyte, and colonies which undergo the slightest water-lack—even under conditions of constant and heavy precipitation—show brown discoloration and frond-curling very quickly. I have seen the following specimens.—GUADELOUPE: *L'Herminier*, s.n. (NY); grand bois des Bains Jaunes, 500–1000 m., *Duss*, no. 4265 (NY). DOMINICA: Morne Diablotin, 4000 ft., *Fishlock*, nos. 34 and 50 (p.p.) (NY); mossy forests at the summit of Morne Trois Pitons, 1500 m., no. 1412 (G, US). MARTINIQUE: Montagne Pelée, Calebasse, 500–900 m., *Duss*, no. 1519 (NY). ST. VINCENT: Without other data, *Herb. Jenman* (NY).

GRAY HERBARIUM.

PLATE 2.—HYMENOPHYLLUM LATIFRONS van den Bosch: Fig. 1, frond (left) from unusually wet situation and frond (right) from drier, exposed situation, ×1; fig. 2, vestiture, ×10; *Hodge* no. 1412. HYMENOPHYLLUM HIRSUTUM (L.) SW.: Fig. 3, ×1; fig. 4, vestiture, ×10; Jamaica, *Maxon* no. 10189. HYMENOPHYLLUM LANATUM Fée: Fig. 5, ×1; fig. 6, vestiture, ×10; Jamaica, *Maxon* no. 9589.

The Gold Rush: A Fern Ally

RALPH C. BENEDICT

Whether to "view with alarm" or to "point with pride" to the elevation to a position of economic importance of a species under the jurisdiction of the Fern Society is a question posed for members in a recent address by a mining engineer. Fern lovers have hitherto been able to claim that their interest in these plants was unsullied by any ulterior motive. Fern study offers strong incentives to those who love beauty of form and leaf for its own sake, and for the pleasure of searching for it in its own haunts or of sheltering and preserving

it in shaded garden corners. Ferns offer no inducement to those who must find some pecuniary profit as a reason for their interest.

That ferns are completely without economic value is not to be maintained. The fern lover points with tolerant interest to such oddities as the fern from which a worm medicine is obtainable, or that from which fibers for millinery purposes are derived by South Sea dandies, or to the feeding of tree-fern trunks to hogs in the Hawaiian Islands, or to the use of another fern as a special food for native New Zealanders. Collected from the back volumes of the JOURNAL, a considerable number of such particular uses could be assembled. Incidentally, the report that canned fern greens are obtainable as a substitute for spinach is being investigated. In general, however, ferns of today may be said to have retired from active participation in service to man, resting upon their laurels—if this paradox may be admitted. It will be a considerable time before their contributions—the many millions of tons of coal made three hundred million years ago or more—will have been completely used up.

The new claimant among ferns for economic consideration was reported by Mr. Hans Lundberg of Toronto. Speaking before the annual meeting of the American Institute of Mining and Metallurgical Engineers, February 18, 1941, on "New Techniques in Geoexploration." Mr. Lundberg reported on a variety of methods of exploration for gold and other metals. The current significance of his address may be indicated by the fact that some of these are referred to as "war minerals." He noted that "recently, more direct and truly qualitative methods have been brought into a useful and practical stage, and by the combined application of old and new methods a technique has been developed which, it is hoped, will be of the utmost importance in the search for

these vital minerals.'' It is in this connection that a member of the fern group, broadly speaking, is involved.[1]

Referring to the fact that although older as well as newer practical methods involving geophysical procedures, magnetic and electrical methods, et alia had all proved of value in some regions, he noted that these techniques had failed completely in other cases and that their practical use was sometimes very limited. The newest methods described are an outgrowth of geochemical and radioactive tests, by which the smallest traces of soluble metals may be detected; even elements like gold, which are highly insoluble, will dissolve sufficiently to allow their presence to be recorded by the most delicate chemical tests. Thus, the soil and ground water of a given region will contain recognizable amounts of any metals present in the locality.

In pursuing these newest methods the first step is the concentration of a sample of the water, to bring the amount of dissolved substances to a more easily determinable quantity. This is where our fern friend comes into the picture. The common Horsetail, *Equisetum arvense*, has a special acquisitiveness for gold in solution. This selectivity is an expression of a familiar and universal botanical phenomenon known as ''selective absorption.'' Plants growing with their roots tangled in the same soil and bathed in the same soil water never contain the same percentages of mineral constituents. Furthermore different plants select and often accumulate quantities of elements to much higher percentages than these are found in the soil in which they grow.

According to Mr. Lundberg: ''Different plants concentrate gold at different rates; the largest gold content has been found in the common Horsetail (*Equisetum*

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[1] A copy of Mr. Lundberg's address has been deposited in the library of the Fern Society.

arvense); almost 4½ oz. gold per ton is on record." Though a percentage of 4½ ounces per ton of *Equisetum* might well represent "pay dirt," a word of caution should perhaps be inserted here. From the mining expert's point of view this plant is counted of value primarily as an "indicator," to be analyzed by the most careful chemical methods as a test for the presence of gold in solution in the soil water. In a letter Mr. Lundberg writes: "At the present time we are not interested in 'growing gold,' but in the fact that the plant contains a considerable amount of colloidal silica and has this uncanny power of concentrating gold it is a subject worthwhile following further." *Equisetum arvense* can not concentrate gold when the latter does not exist in the soil, so don't start harvesting the heavy crops of this scouring rush which often occur on railroad embankments! However, any mining engineers or metallurgists included in the Fern Society membership may be interested to add to other phases of fern study tests of the *Equisetum arvense* in their neighborhood. Perhaps other species of *Equisetum* will prove to have a similar selective capacity. In that case, the pages of the JOURNAL with the late Professor Schaffner's extensive contributions on the classification and distribution of the genus *Equisetum* may come to have especial value as reference literature in engineering libraries.

Looking a little farther ahead, one may perhaps anticipate that future dictionaries and encyclopedias will add another entry to their references under the heading "gold rushes." For example, in sequence with "Gold rush, California, 1849, etc.," "Yukon, 1898, etc.," a new entry may be expected, as follows: "Gold rush, a fern ally, *Equisetum arvense*; so called because of its capacity to accumulate gold in its tissues whenever this metal is present in the substratum in any appreciable quantity."

BROOKLYN BOTANIC GARDEN
AND BROOKLYN COLLEGE.

State and Local Fern Floras of the United States

S. F. BLAKE

(Conclusion)

MARYLAND (BB, G)

Plitt, Charles C. The ferns and fern allies found in the vicinity of Baltimore, Maryland. Journ. Maryland Acad. Sci. **2**: 195–201. 1931.—Annotated list.

***Shreve, Forrest,** and others. The plant life of Maryland. 533 pp., 15 fig., 39 pl. (incl. map). 1910. (Maryland Weather Service. Special publication v. 3.)—Includes annotated list of Pteridophyta (p. 386–390); bibliography.

***Tidestrom, Ivar.** Elysium marianum. Ferns and fern allies. 2d ed. 63 pp., 9 pl. 1907. (Ed. 1, 56 pp., 7 pl., 1906.)—Briefly annotated list covering Maryland and Virginia, with keys and short descriptions.

MASSACHUSETTS (BB, G)

Bartlett, Mira W. Ferns. Bull. Haverhill Public Library **8**: 17–19. 1924.—Includes mostly unannotated lists of Filicineae and Lycopodiaceae found in Haverhill. (Essex County.)

***Churchill, Joseph R.,** and others. Reports on the flora of Massachusetts.—I–II. Rhodora **30**: 12–19. 1928; **35**: 351–359. 1933.—Annotated list of Pteridophyta.

Clarkson, Edward H. Ferns of Newburyport, Massachusetts. A. F. J. **19**: 109–110. 1929.—Unannotated list of Filicineae. (Essex County.)

Goodale, Alfred S. A check list of Pteridophyta (fern-worts) occurring in the Connecticut River watershed in Massachusetts. Cover-title, prel. l., 6 numb. l., 1 l. (index). 1932.—Drainage, etc.; unannotated list of Pteridophyta. (Hampshire and parts of Franklin, Hampden, Worcester, and Berkshire Counties.)

Martin, Mary W. Live fern display at the Berkshire Museum, Pittsfield, Mass. A. F. J. **25**: 120–122. 1935.—Includes unannotated list of Pteridophyta from Berkshire County.

Osterlund, Peter. Another rich fern locality. A. F. J. **11**: 120–121. 1921 [1922].—Running account of Filicineae of North Adams, Berkshire County.

Owen, Maria L. Ferns of Mt. Toby, Massachusetts. Rhodora **3**: 41–43. 1901.—Running account of Filicineae. (Franklin County.)

Robinson, John. Ferns of Essex County, Mass. Bull. Essex Inst. **7**: 44–54. 1875. Addenda . . . l. c. **7**: 147–148. 1875 [1876]. Additions . . . l. c. **9**: 98. 1877.—Annotated list of Pteridophyta.—See also his The flora of Essex County, Massachusetts. 200 pp. 1880. (Includes Pteridophyta.)

Winslow, Evelyn J. Ferns of northern Berkshire County, Massachusetts. A. F. J. **3**: 13–16. 1913.—Partly annotated list of Pteridophyta from Cheshire, Lenox, Mount Greylock, and vicinity.—See also **Burnham, S. H.** More ferns from north Berkshire County. l. c. **3**: 121. 1913.

MICHIGAN (BB, G)

Burnham, Stewart H. Ferns of Ann Arbor, Michigan. F. B. 12: 50–51. 1904.—Running account of Pteridophyta. (Washtenaw County.)

***Dodge, Charles K.** The fern flora of Michigan. F. B. 20: 6–19. 1912.—Topography, etc.; annotated list of Pteridophyta.—See also **Hull, Edwin D.** Notes on . . . Amer. Bot. 19: 48. 1913.

Farwell, Oliver A. Fern notes, III. Ferns and fern allies of the Keweenaw Peninsula, Michigan. A. F. J. 27: 11–20. 1937.—Annotated list.

McFarland, Frank Y. The ferns and their distribution at Douglas Lake, Michigan. A. F. J. 6: 106–112. 1916.—Climate, ecology, etc.; list of Filicineae, grouped by habitat. (In Emmet and Cheboygan Counties.)—See also **Gates, Frank C.**, and **John H. Ehlers.** An annotated list of the higher plants of the region of Douglas Lake, Michigan. Papers Michigan Acad. Sci. 4: 183–284. 1925.—Additions . . . l. c. 8: 111–120. 1928; 13: 67–88. 1931.

MINNESOTA (BB, G, Rp)

See also Iowa (**Pammel** and **King**).

***Lyon, Harold L.** The pteridophytes of Minnesota. Minn. Bot. Stud. 3: 245–255. 1903.—Annotated list.

***Rosendahl, Carl O.**, and **Frederic K. Butters.** Guide to the ferns and fern allies of Minnesota. 22 pp., illus., pl. 1909. (Minnesota plant studies III.)—Unannotated key to families, genera, and species, with figure of each species.

MISSISSIPPI (S, Sf)

***Lowe, Ephraim N.** Plants of Mississippi. A list of flowering plants and ferns. Bull. Miss. State Geol. Surv. 17. 292 pp., map. 1921.—Includes (p. 59–64) briefly annotated list of Pteridophyta.

MISSOURI (BB, G)

Call, Richard E. Some ferns of the Ozark region of Missouri. Proc. Iowa Acad. Sci. 1: 15–16. 1889.—Running account of Filicineae collected in Shannon, Reynolds, and Texas Counties.

Greene, Frank C. The ferns of northwestern Missouri. F. B. 19: 14–15. 1911.—Running list of Pteridophyta.

———. A preliminary list of the ferns of Rolla, Missouri. A. F. J. 5: 105–107. 1915.—Topography, etc.; annotated list of Filicineae. (Phelps County.)

Palmer, Ernest J. Adventures in fern collecting—III. A. F. J. 30: 1–9. 1940.—Includes (p. 7–9) annotated list of Pteridophyta of Jasper County.

*——— and **Julian A. Steyermark.** The ferns and fern allies of Missouri. A. F. J. 22: 105–122. 1 fig., *pl. 7*. 1932 [1933].—The family Isoetaceae in Missouri. l. c. 23: 65–66. 1933.—Additional fern records from Missouri. l. c. 25: 1–6. 1935.—Topographical regions, geology, etc.; annotated list.

***Pinkerton, Mary Elizabeth.** Ferns and fern allies of Missouri. Annals Missouri Bot. Gard. 20: 45–77. *f. 1* (map), *pl. 5*,

fold. tab. 1933.—Annotated list with keys, short descriptions, and citation of exsiccatae.

Prince, S. Fred. Some ferns of the cave region of Stone County, Missouri. F. B. **12**: 72–77. 1904.—Rocks, climate, etc.; annotated list of Filicineae from vicinity of Marble Cave.—See also his Fern notes. A. F. J. **8**: 4–8. 1918.

Standley, Paul C. The ferns of Greene County, Missouri. A. F. J. **6**: 44–51. 1916.—Geology, etc.; annotated list of Pteridophyta. Includes also region about Graydon Springs, Polk County.—See also **Bush, B. F.** Standley's Ferns of Greene County, Mo. l. c. **6**: 112–116. 1916.

MONTANA (F, N [part], R)

***Fitzpatrick, Thomas J.** The fern flora of Montana. F. B. **12**: 97–101. 1904.—Annotated list of Pteridophyta.—See also **Graff, Paul W.** Unreported ferns from Montana. Bull. Torrey Club **47**: 125–129. 1920; also note on Graff's paper by W[eatherby], C. A. A. F. J. **10**: 89. 1920.

Standley, Paul C. Ferns of Glacier National Park, Montana. A. F. J. **10**: 97–110. 1920 [1921].—Life zones, etc.; annotated list of Pteridophyta.

NEBRASKA (BB, R [western part], Rp)

***Fitzpatrick, Thomas J.** The fern flora of Nebraska. I–II. A. F. J. **10**: 5–15, 33–44. 1920. (Contr. Dept. Bot. Univ. Nebr. no. 30.) (Also in Proc. Iowa Acad. Sci. **26** (1919): 311–326. 1920. [Does not include Ophioglossum.])—Physiographic divisions, etc.; annotated list of Pteridophyta.

***Petersen, Niels F.** Flora of Nebraska. A list of the ferns, conifers and flowering plants of the state with keys for their determination. 3d ed. 220 pp. 1923.—Annotated list including Pteridophyta (p. 9–13).

NEVADA

***Tidestrom, Ivar.** Flora of Utah and Nevada. Contr. U. S. Nat. Herb. v. 25. 665 pp. 15 pl., map. 1925.—Annotated, keyed list including Pteridophyta (p. 43–52), the latter by William R. Maxon. The floras of the two states are treated as a unit.

NEW HAMPSHIRE (BB, G)

***Knowlton, Clarence H., Winfield S. Ripley, Jr.,** and **Charles A. Weatherby.** Preliminary lists of New England plants,—XXVII. Rhodora **22**: 80–89. 1920.—Preliminary lists . . . XXVIII. l. c. **23**: 209–220. 1921.—Tabular lists of the Polypodiaceae, Schizaeaceae, and Osmundaceae (XXVII) and the Ophioglossaceae, Marsileaceae, Salviniaceae, Equisetaceae, Lycopodiaceae, and Selaginellaceae (XXVIII) of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut, showing their presence or absence in each state, with discussion of distribution in the area and localities of rarer species. The Isoetaceae have not yet been treated in this series.

Lewis, Charles S., and **William F. Lewis.** A list of ferns found in New Hampshire. A. F. J. **11:** 82–85. 1921 [1922].—Annotated list of Filicineae collected by authors at 4 localities in central New Hampshire.

Noyes, Helen M. Ferns of Alstead, New Hampshire. Rhodora **2:** 181–185. 1900.—Running account of Filicineae. (Cheshire County.)

NEW JERSEY (BB, G)

See also ***Small, J. K.**, under New York.

Benedict, Ralph C. Afield for ferns in Sussex County, New Jersey. A. F. J. **19:** 105–108. *f. 6.* 1929.—Includes unannotated list of Filicineae collected at The Pines, Branchville.—See also his Fern hunting at Branchville. Torreya **29:** 108–110. 1929.

***Britton, Nathaniel L.** Catalogue of plants found in New Jersey. Final Rep. Geol. Surv. New Jersey **2:** 27–642. 1889 [1890].—Includes (p. 302–313) annotated list of Pteridophyta.

Carhart, Macy. A collector's list of New Jersey ferns. A. F. J. **6:** 51–54. 1916.—Annotated list of Pteridophyta collected by author, with his localities.

Lewis, Charles S. Some ferns of northern New Jersey. A. F. J. **14:** 118–122. 1924 [1925].—Includes list of Filicineae collected by author in the limestone and lake region of north-central New Jersey.

Saunders, Charles F. Ferns in the New Jersey pine barrens. F. B. **6:** 21–23. 1898.—Running account of Pteridophyta.—See also **Stone, Witmer.** The plants of southern New Jersey, with especial reference to the flora of the pine barrens and the geographic distribution of the species. Ann. Rep. N. J. State Mus. **1910:** 23–828. 5 fig., 129 pl.. 1911 [1912].—Also **Hollinshead, Martha H.** Ferns of the New Jersey pine barrens. Torreya **38:** 63–66. 1938. (Running account of Filicineae.)

***Taylor, Norman.** Flora of the vicinity of New York. Mem. N. Y. Bot. Gard. v. 5. vi, 683 pp., 9 maps. 1915.—Annotated, keyed list including Pteridophyta (p. 47–67); covers all of New Jersey and Connecticut, Long Island, southeastern New York, and eastern Pennsylvania.

NEW MEXICO (N [northern part])

Standley, Paul C. The ferns of Brazos Canyon, New Mexico. A. F. J. **4:** 109–114. *pl. 1–2.* 1914.—Topography, etc.; annotated list of Pteridophyta. (Rio Arriba County.)

***Tidestrom, Ivar**, and **Teresita Kittell.** A flora of Arizona and New Mexico. xxvi, 897 pp., map. (Processed publication.)—Annotated, keyed list of vascular plants, including Pteridophyta (p. 862–881), the latter by the junior author; range given only in general terms.

Wooton, Elmer O. The ferns of the Organ Mountains. Torreya **3:** 161–164. 1903.—Annotated list of Filicineae. (Dona Ana County.)

*——— and **Paul C. Standley.** The ferns of New Mexico. A. F. J. **5:** 65–78. *pl. 5–6.* 1915.—Topography, etc.; annotated list of Pteridophyta.

NEW YORK (BB, G)

See also **Taylor, N.**, under New Jersey.

Benedict, Ralph C. An Adirondack fern list. A. F. J. **6:** 81–85. 1916.—Running account of Filicineae collected near the Fulton chain of lakes, in Herkimer and Hamilton Counties.—See also additions by **Brown, Alexander W.** l. c. **7:** 18–19. 1917.

Bissell, Charles H. American Fern Society. The Syracuse meeting. A. F. J. **5:** 118–120. 1915.—Includes unannotated list of Filicineae. (Onondaga County.)

Burnham, Stewart H. The ferns of the Lake George flora, New York. A. F. J. **6:** 85–90, 97–105. 1916; **7:** 12–15, 54–63. 1917.—Supplementary list . . . l. c. **13:** 109–113. 1923 [1924].—Geology, etc.; annotated list of Pteridophyta. (Washington, Warren, and Saratoga Counties, with a few records from Essex and Hamilton Counties.)

[Chester, Lavinia E.] Shelter Island ferns. F. B. **17:** 114. 1909.—Unannotated list of 16 Filicineae from Shelter Island, Long Island. (Suffolk County.)

Clute, Willard N. The ferns and fern allies of the upper Susquehanna valley. Reprinted, with notes, from "The flora of the upper Susquehanna." 15 pp. 1898.—Annotated list. (Mostly in southern New York, including the Chemung and Chenango valleys; also parts of Bradford, Susquehanna, Tioga, and Wayne Counties, Penn.)—See also **Cleveland, George T.** Ferns of the upper Susquehanna valley. F. B. **16:** 101–103. 1908.

Dowell, Philip. Distribution of ferns on Staten Island. Proc. Staten Island Assoc. Arts & Sci. **1:** 61–67. 1906.—Partly annotated list of Filicineae. (Richmond County.)—See also his Notes on some Staten Island ferns. l. c. **3:** 163–168. 1911 [1912].

Edson, Josephine Z. Ferns of Monroe and adjoining counties, New York. A. F. J. **18:** 56–57, 87–93. 1928.—Annotated list of Filicineae.

***Gilbert, Benjamin D.** The fern flora of New York. F. B. **11:** 97–105. 1903.—Plant zones, etc.; annotated list of Pteridophyta.—See also **Hill E. J.** Remarks on some fernworts of western New York. l. c. **12:** 18–20. 1904.

***House, Homer D.** Annotated list of the ferns and flowering plants of New York state. N. Y. State Mus. Bull. 254: 5–759. 1924.—Additions to the fern flora of New York state. A. F. J. **23:** 1–7. *pl. 1.* 1933.—The 1924 publication includes annotated list of Pteridophyta (p. 12–41).

Knauz, Marie B. Ferns and club-mosses at Little Moose Lake, Adirondack Mts. Trillia **9:** 41–42. 1930.—Annotated list of Pteridophyta. (Herkimer County.)

Lewis, Charles S. Ferns of the Marcy region. A. F. J. **16:** 10–17. 1926.—Running account of Pteridophyta of the region of Mount Marcy and Keene, Essex County.

Seelye, Charles W. A list of the indigenous ferns of the vicinity of Rochester, with notes. Proc. Rochester Acad. Sci. **1:** 186–197. 1891. (Reprinted, with addition of "Cultural notes," in Proc. West. N. Y. Hort. Soc. **37** (1892): 472–491. [1892]).—Annotated list of Filicineae. (Monroe County.)

Small, John K. Ferns of the vicinity of New York; being descriptions of the fern-plants growing naturally within a hundred miles of Manhattan Island. 285 pp. (incl. illus.), fold. map. 1935.—Botanical regions, etc.; annotated descriptive account of Pteridophyta, with keys. Covers all of Connecticut and New Jersey, southeastern New York, and eastern Pennsylvania.

———. Native ferns in the New York Botanical Garden. Journ. N. Y. Bot. Gard. **35**: 148–151. 1 fig. (map). 1934.—Includes unannotated list of Pteridophyta. (In New York City.)

Standley, Paul C. Some ferns of Dutchess County, New York. A. F. J. **6**: 1–7. 1916.—Topography, etc.; annotated list of Pteridophyta.

Taylor, Aravilla M. Some pteridophytes of the western Catskills. A. F. J. **14**: 85–88. 1924.—Unannotated list of Pteridophyta from near the village of Andes, Delaware County.

Underwood, Lucien M. The ferns of Scolopendrium Lake. F. B. **5**: 53–54. 1897.—List of 34 species of Filicineae within radius of 1½ miles, near Jamesville, Onondaga County.

NORTH CAROLINA (S, Sf)

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*———, and **Donovan S. Correll.** A county check list of North Carolina ferns and fern allies. Journ. Elisha Mitchell Sci. Soc. **56**: 63–105. map. 1940.—Annotated list, with citation of exsiccatae by counties.

Boggess, Randolph. Ferns of the Smoky Mountain region. Proc. West Virginia Acad. Sci. **8**: 56–58. 1935.—Topography, etc.; annotated list of Filicineae. (Haywood County, chiefly.)

Coker, William C. Chapel Hill ferns and their allies. Journ. Elisha Mitchell Sci. Soc. **23**: 134–136. 1908.—Annotated list of Pteridophyta. (Orange County.)

Hall, Earl H. A partial check list of the ferns found in the Mountain Park and Roaring Gap region. Journ. Elisha Mitchell Sci. Soc. **46**: 69–71. 1930.—Unannotated list of Filicineae. (In Surrey and Alleghany Counties.)—See review in A. F. J. **24**: 22. 1934.

NORTH DAKOTA (BB [eastern part], R [western part], Rp)

***Bergman, Herbert F.** Flora of North Dakota. Bienn. Rep. Agr. Coll. Surv. North Dakota **6**: 151–372. 1918. (Reprinted.)—Includes annotated list of Pteridophyta, with keys (p. 362–366).

OHIO (BB, G)

***Hopkins, Lewis S.** The fern flora of Ohio. F. B. **15**: 1–13. 1907.—Further notes on the fern flora of Ohio. A. F. J. **2**: 115–119. 1912.—Topography, etc.; annotated list of Pteridophyta.

***Schaffner, John H.** The pteridophytes of Ohio. Proc. Ohio Acad. Sci. v. 5, pt. 5, spec. paper no. 16. p. 265–305. illus. 1910. (Contr. Bot. Lab. Ohio State Univ. 52.)—Annotated list, with keys

and brief descriptions.—See also **Braun, E. L.** Ophioglossum Engelmanni Prantl in Ohio. A. F. J. **17:** 138. 1927 [1928].—Also **Schaffner, J. H.** The climbing fern discovered in Ohio. A. F. J. **22:** 136. 1932 [1933].

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OKLAHOMA (S [all except area west of 100° W.L.])

***Bush, Benjamin F.** Ferns of Oklahoma. Amer. Midl. Nat. **12:** 91–112. 1930.—Botanical explorations, topography, botanical regions; annotated list of Pteridophyta, with citation of exsiccatae.—See review in A. F. J. **20:** 120–122. 1930.—Also **Little, E. L., Jr.** Asplenium pinnatifidum Nutt. in Oklahoma. l. c. **22:** 23. 1932.

***Featherly, Henry I.,** and **Clara S. Russell.** The ferns of Oklahoma. Oklahoma Agr. Exp. Stat. Circ. 80. Revised. 24 pp., 42 fig., pl. 1939.—Annotated, keyed list of Filicineae, with brief descriptions and citation of localities and collectors.

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***Stemen, Thomas R.,** and **William S. Myers.** Oklahoma flora. xxix, 706 pp., 494 fig. 1937.—Annotated, keyed, descriptive flora, including Pteridophyta (p. 1–21, fig. 1–40).

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OREGON (A, F)

***Peck, Morton E.** A manual of the higher plants of Oregon. 866 pp., front., illus., map. 1941.—Descriptive flora of vascular plants, with keys; treatment of Pteridophyta (p. 43–57) by J. W. Thompson.

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29 pp., illus. 1913.—Briefly annotated list of Filicineae, with key. Descriptions taken from a thesis by Hannah M. Kenworthy, pen-and-ink drawings by Ruth M. Howell, editorial work and photographs by Albert R. Sweetser.—See also record of *Adiantum jordani* by Nelson, J. C. **A. F. J. 8: 16–17. 1918.**

Wynd, F. L. The ferns of Crater Lake National Park. A. F. J. **19:** 37–41. 1929.—Annotated list of Filicineae. (Klamath County.)—See also his The flora of Crater Lake National Park. Amer. Midl. Nat. **17:** 881–949. 1936. (Includes unannotated list of Pteridophyta.)—Also **Applegate, Elmer I.** Plants of Crater Lake National Park. l. c. **22:** 225–314. 3 pl. 1939. (Includes annotated list of Pteridophyta.)

PENNSYLVANIA (BB, G)

See also **Taylor, N.**, under New Jersey; **Clute, W. N.**, under New York.

Bell, Frank. The ferns of Greene County, Pennsylvania. Castanea **4:** 5–6. 1939.—Running account of Pteridophyta.

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Gruber, Calvin L. Ferns and fern allies in the Kutztown-Fleetwood area, Berks County, Pennsylvania. A. F. J. **30:** 41–49, 89–98. 1940.—Topography, etc.; annotated list.—Additional forms of ferns in the Kutztown-Fleetwood area, Pa. l. c. **31:** 73. 1941.

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***Porter, Thomas C.** Catalogue of the Bryophyta (hepatics, anthocerotes and mosses) and Pteridophyta (fern and fern-allies) found in Pennsylvania. 66 pp. 1904.—Includes annotated list of Pteridophyta (p. 54–66), with county records.

Portman, Agnes. Ferns in the vicinity of Nawakwa Lodge, Laurel Hill Mountains, southeast of Ligonier, Pa. Trillia **8:** 38–39. 1925.—Annotated list of Pteridophyta, the fern allies by O. E. Jennings. (Westmoreland County.)

***Poyser, William A.** The fern flora of Pennsylvania F. B. **17:** 65–83. 1909.—Topography, etc.; annotated list of Pteridophyta.—See also **Gress, Ernest M.**, and **Harry B. Kirk.** Some recent records of Pennsylvania ferns, lycopods, and selaginellas. Proc. Penn. Acad. Sci. 8: 30–34. 1934.—Also **Wherry, E. T.** Notable Pennsylvania ferns. **l. c. 11: 52–54. 1937.**

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Tanger, Louise F. A. Ferns and fern allies of Lancaster County, Pennsylvania, 1931 and 1932. A. F. J. **23:** 13–18. 1933.—Soils, etc.; annotated list.

RHODE ISLAND (BB, G)

See ***Knowlton, C. H.,** under New Hampshire.

***Wright, Kenneth E.,** and **Dorothy L. Crandall.** Rhode Island ferns. Torreya **41:** 73–75. 1941.—Unannotated list of Filicineae; bibliography.

SOUTH CAROLINA (S, Sf)

Bragg, Laura M. Preliminary list of the ferns of the coast region of South Carolina north of Charleston. A. F. J. **4:** 83–93. 1914.—Botanical explorations, etc.; annotated list of Pteridophyta.—See also **Wherry, E. T.** Two calcareous-soil ferns in lower South Carolina. *In* his Fern field notes, 1936. l. c. **26:** 127. 1936.

***Matthews, Velma D.** The ferns and fern allies of South Carolina. A. F. J. **30:** 73–80, 119–128. map. 1940–41; **31:** 4–11. 1941.—Annotated list, with citation of localities and collectors.

SOUTH DAKOTA (BB [eastern part], N [Black Hills], R [western part], Rp)

***Over, William H.** Flora of South Dakota. An illustrated check-list of flowering plants, shrubs and trees of South Dakota. 161 pp., illus., pl. 1932.—Annotated list including Pteridophyta (p. 11–13).

TENNESSEE (S, Sf)

***Anderson, William A., Jr.** The ferns of Tennessee. Univ. Tenn. Record, Ext. Ser. v. 6, no. 1. 40 pp., 13 fig. 1929.—Annotated list of Filicineae, of a popular nature.

*———. A list of Tennessee ferns. A. F. J. **20:** 143–150. 1930 [1931]; **21:** 11–20, 64–71. 1931.—Annotated list of Filicineae; biliography.—See also **Underwood, Judson K.,** and **Aaron J. Sharp.** Notes on Tennessee ferns. l. c. **23:** 98–99. 1933. (Adds 2 species.)—Also **Sharp, A. J.** Notes on ferns of the southern Appalachians. Journ. Tenn. Acad. Sci. **12:** 186. *f. 1.* 1937. (Adds 1 species, plus 1 *Lycopodium.*)

Bartoo, Dorr R. All in a day's trip—Tennessee. A. F. J. **27:** 6–10. 1937.—Includes unannotated list of Pteridophyta of Putnam County.

Endsley, J. R. A preliminary report of the ferns of Chester County, Tennessee. Journ. Tenn. Acad. Sci. **10:** 106–110. 3 fig. 1935.—Topography, etc.; annotated list of Filicineae.

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McGill, John T. Ferns found in the vicinity of Sewanee. Trans. Tenn. Acad. Sci. **2:** 66–68. 1917.—Unannotated list of Filicineae. (Franklin County.)

Shaver, Jesse M. Vacationing among Tennessee ferns. A. F. J. 27: 73–90. *pl. 4.* 1937.—Includes list of Pteridophyta collected, with localities; bibliography.

TEXAS (S [west to 100° W.L.])

***Bush, Benjamin F.** A list of the ferns of Texas. Bull. Torrey Club 30: 343–358. 1903.—Botanical explorations; annotated list of Filicineae, with citation of exsiccatae.

***Cory, Victor L.,** and **Harris B. Parks.** Catalogue of the flora of Texas. Bull. Texas Agr. Exp. Stat. 550. 130 pp., map. 1937 [1938].—Unannotated list including Pteridophyta (p. 10–12), the range indicated by districts. See review by **E. T. W[herry],** correcting some errors, in A. F. J. 28: 113. 1938.

Palmer, Ernest J. Ferns of the Davis Mountains, western Texas. A. F. J. 17: 77–85. 1927.—Topography, etc.; annotated list of Pteridophyta. (Jeff Davis County.)—See also his Additional notes on Texas ferns. l. c. 20: 138–142. 1930 [1931]. (Includes additions to Davis Mountains list, and a list of Filicineae from the Chisos Mountains.)

———. Texas Pteridophyta. A. F. J. 9: 17–22, 50–56, 81–85. 1919.—Soils, climate, etc.; annotated list of Pteridophyta collected by author over most parts of the state except the area west of the Pecos River.

***Reverchon, Julian.** The fern flora of Texas. F. B. 11: 33–38. 1903.—Botanical districts, etc.; annotated list of Pteridophyta.

Wherry, Edgar T. A fernless area. A. F. J. 17: 63–64. 1927.—The only pteridophyte found in two days' collecting around Brownsville, Cameron County, by J. K. Small, Robert Runyon, and the author was *Marsilea vestita.*

UTAH (N [eastern part], R)

No separate state flora or fern flora; see ***Tidestrom, I.,** under Nevada. Species new to Utah are recorded by **Garrett, Albert O.** Asplenium viride and Cryptogramma stelleri in Utah. A. F. J. 16: 27–28. 1926; Azolla caroliniana Willd. in Utah. l. c. 16: 98. 1926.

VERMONT (BB, G)

See also ***Knowlton, C. H.,** under New Hampshire.

Andrews, Albert LeRoy. Ferns of a deep ravine in Thetford, Vermont. Rhodora 2: 229–230. 1900.—Running account of Pteridophyta. (Orange County.)

Blake, Sidney F. Notes on the ferns of the Champlain Valley. A. F. J. 4: 115–119. 1914.—Running account of Pteridophyta collected by author in vicinity of Burlington, Essex Junction, and Swanton.

David, Walter W. Ferns of the Lake Dunmore region, Salisbury, Vermont. Bull. Boston Soc. Nat. Hist. 62: 3–11. 3 fig. 1932.—Topography, etc.; unannotated, keyed list of Filicineae. (Addison County.)—See review in A. F. J. 22: 52. 1932 (adds *Asplenium platyneuron*).

***Dole, Eleazer J.,** ed. The flora of Vermont. 3d rev. ed. An

annotated list of the ferns and seed plants of the state of Vermont. Compiled by a committee of the Vermont Botanical Club. xiv, 353 pp., port. 1937.—Includes Pteridophyta (p. 1–18).

***Eggleston, Willard W.** The fern flora of Vermont. F. B. **13:** 33–41. 1905.—Botanical divisions, special localities, etc.; annotated list of Pteridophyta.—See also **Gilman, Clarabel.** Two ferns new to the flora of Vermont. Rhodora **7:** 103–105. 1905.

Rugg, Harold G. Vermont, the fern lover's paradise. A. F. J. **2:** 83–93. 1912.—Running account of many of the rarer or more interesting Filicineae.

Slosson, Margaret. A rich fern locality. F. B. **6:** 51. 1898.—List of 39 species and 8 varieties of Filicineae from near Pittsford, Rutland County.

Straw, Carrie E. Ferns of Smugglers' and Nebraska Notches. Plant World **6:** 180–181. *pl. 24.* 1903.—Running account of Filicineae. (Mount Mansfield.)

Terry, Emily H. Dorset ferns. F. B. **6:** 7–8. 1898.—More about the ferns of Dorset. l. c. **13:** 84–85. 1905.—Additional Dorset ferns. l. c. **15:** 49. 1907.—List of 55 species and varieties of Filicineae (including additions) from Dorset, Bennington County.—See also **Bourn, Allan.** The Botrychiums of Dorset, Vermont. Bull. Vt. Bot. Club. **3:** 17. 1908.

Winslow, Evelyn J. Willoughby Lake, Vt., a candidate for the title of "richest fern locality." A. F. J. **9:** 107–109. 1919 [1920].—Comparison with other rich localities, with included list of Filicineae. (Orleans County.)—See also his note in A. F. J. **11:** 121. 1921 [1922], adding *Athyrium angustifolium.*

VIRGINIA (BB, G)

See also ***Tidestrom, I.**, under Maryland.

Lewis, John B., and **Arthur B. Massey.** Ferns and fern allies of Amelia County, Virginia. Virginia Journ. Sci. **1:** 26–29. 1940.—Soils, etc.; annotated list.

Massey, Arthur B., and **Robert P. Carroll.** Ferns and fern allies of Mountain Lake, Giles County, Virginia. Claytonia **4:** 45–48. 1938.—Soils, etc.; annotated list.—See also **Meyer, Samuel L.** Pteridophyta of a bog near "White Pine Lodge," Giles County, Virginia. Virginia Journ. Sci. **1:** 29–30. 1940. (Running account of species.—Also his Pteridophyta of the "Cranberry Bog," near Mountain Lake, Virginia. Claytonia **5:** 46–48. 1 fig. 1939. (Annotated list.)

Palmer, William. The ferns of Hemlock Bluff. Plant World **2:** 143–147. 1 fig. 1899.—Topography, etc.; running account of Filicineae. (Along Potomac River, at mouth of Scott Run, in Fairfax County.)

———. Ferns of the Dismal Swamp, Virginia. Proc. Biol. Soc. Wash. **13:** 61–70. *pl. 1.* 1899.—Habitats, etc.; annotated list of Filicineae.

Tuttle, Mary L. Fern trips in Virginia. A. F. J. **5:** 108–113. 1915.—Includes lists of Filicineae from Rock Enon Springs, Frederick County, and Natural Bridge, Rockbridge County.

Weatherby, Charles A. Nomenclature of Virginia ferns. Claytonia **2:** 41–45. 1936.—Unannotated alphabetical list of Virginia

Pteridophyta (not complete in some genera), showing nomenclatorial changes made since issue of Gray's Manual (ed. 7) in 1908. (Multigraphed.)

Wherry, Edgar T. Some fern finds in Virginia. A. F. J. **15:** 1–7. *pl. 1–2.* 1925.—*Thelypteris simulata* and other species and forms new or rare in Virginia.—See also his Further occurrences of the Alleghany cliff-fern. l. c. **19:** 101–102. 1929. (*Woodsia scopulina*, new to Virginia.)

WASHINGTON (A, F)

Brockman, Christian Frank. Ferns of Mt. Rainier National Park. Mount Rainier Nat. Park Nature Notes v. 15, no. 1. 44 pp., illus. 1937.—Annotated descriptive account of Pteridophyta, with key.—(Mimeographed.)—See also **Jones, George N.** The flowering plants and ferns of Mount Rainier. Univ. Wash. Publ. Biol. v. 7. 192 pp., 9 pl. 1938. (Includes annotated list of Pteridophyta, with keys and descriptions, p. 17–25.)

***Flett, John B.** The fern flora of Washington. F. B. **11:** 79–85. 1903.—Botanical regions, etc.; annotated list of Pteridophyta.—See also **Fitzpatrick, T. J.** Notes on the ferns of Washington. l. c. **12:** 108–110. 1904.

***Frye, Theodore C.,** and **Mary M. Jackson.** The ferns of Washington. A. F. J. **3:** 65–83, 97–108. *pl. 1–4, 6–8.* 1913; **4:** 7–14, 41–57. *pl. 9–21.* 1914.—Keyed descriptive list of Pteridophyta, with figure of each species; general range given, but not local range.

***Piper, Charles V.** Flora of the state of Washington. Contr. U. S. Nat. Herb. v. 11. 637 pp., 22 pl., map. 1906.—Keyed list including Pteridophyta (p. 76–89), with citation of specimens.

Thompson, John William. 1930 Washington fern notes. A. F. J. **21:** 117–124. *pl. 10.* 1931.—Annotated list of Pteridophyta collected on Mount Baker, Mount Rainier, Mount Angeles, and Mount Stuart.

WEST VIRGINIA (BB, G)

***Brooks, Maurice G.** The pteridophytes of West Virginia. West Virginia Univ. Bull. ser. 39, no. 2. 60 pp., 16 pl. 1938. (Contr. Herb. West Virginia Univ. no. 3.)—Annotated, keyed list, with descriptions, and local range by counties.—See also **Wherry, E. T.** Recent fern finds in West Virginia. Castanea **4:** 1–4. 2 fig. 1939.

Gray, Fred W. Ferns of eastern West Virginia, II. A. F. J. **14:** 1–13. *pl. 1–2.* 1924.—Annotated list of Filicineae from Summers, Monroe, Greenbrier, and Pocahontas Counties.

WISCONSIN (BB, G)

See also Iowa **(Pammel** and **King).**

Ellen, M., *Sister.* Some ferns of southwestern Wisconsin. Trans. Wisc. Acad. Sci. **21:** 249–250. 1924.—Annotated list of Pteridophyta from vicinity of Sinsinawa Mound, Grant County.

Marshall, Ruth. Ferns of Lake Spooner. A. F. J. **7:** 64–65. 1917.—Unannotated list of Filicineae. (Washburn County.)

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*__Steil, William N.__, and __Albert M. Fuller.__ Ferns and fern-allies in Wisconsin. A. F. J. **18**: 105–114. *f. 9–10* (incl. map). 1928; **19**: 1–10. 1929.—Special localities, etc.; annotated list, with citation of specimens by counties for many of the species.—See also __Tryon, R. M., Jr.__ Notes on the ferns of Wisconsin. l. c. **29**: 1–9. *pl. 1.* 1939.

*__Tryon, Rolla M., Jr., Norman C. Fassett, Douglas W. Dunlop,__ and __Melvin E. Diemer.__ The ferns and fern allies of Wisconsin. v, 158 pp., 214 fig., pl., 76 maps. 1940.—Annotated descriptive list, with keys, and figure of each species, the range of each species shown on a map. For a few corrections, see review by __Weatherby, C. A.,__ A. F. J. **31**: 24–25. 1941.

WYOMING (F, N, R)

*__Hanna, Leo A.__ Distribution of the ferns of Wyoming. A. F. J. **22**: 1–11. map. 1932.—Annotated, keyed list of Polypodiaceae, with citation of specimens.

*__Porter, Cedric L.__ The pteridophytes of Wyoming. Torreya **32**: 116–118. 1932.—Annotated list.

Habitats and Distribution of Ophioglossum in Florida

EDWARD P. ST. JOHN

The center of distribution of the genus *Ophioglossum* in the United States is undoubtedly in Florida. Studies of the writer, made during the last five years, have demonstrated the presence of at least nine species in the central part of the state. Descriptions and a key to the recently discovered species are in preparation. Meanwhile the following notes will put on record certain facts in the life histories of the species which have been observed during these years of intensive study, and may be of service to students of ferns who visit Florida.

Most of the species differ notably from the familiar Adder's-tongue of the northern states, *O. vulgatum.*

Several are much smaller, bearing spores when no more than an inch in height. Most of them when in full growth bear several leaves, and in each of three species seven functioning leaves have been found upon a single rootstock. Seasonal growth is very rapid; in some species spores may be shed within three weeks of the first appearance of the leaves. The development of the plant from the spore is much more rapid than reported for *O. vulgatum*. Though a definite statement cannot be made, several lines of evidence lead the writer to believe that in several species the young plants may produce fertile leaves the second year. In two species vegetative reproduction is frequent and very extensive; in two others it is at least occasional.

Except in coldest weather the time of appearance of the leaves seems more dependent upon an abundant supply of moisture than upon temperature, but in spite of prolonged drought a normal succession of species is apparent. In central Florida late December usually brings two or three nights of frost, and from that time until the last of February it is unusual to find plants of any species. By March 1 *O. Engelmanni* begins to thrust up sterile leaves; fertile leaves appear two or three weeks later and may be collected until about August 1. "*O. floridanum*," which is perhaps a subspecies of *O. petiolatum*, appears in April, and is common until June, and again during the autumn months. *O. crotalophoroides* has about the same periods of growth. During April *O. dendroneuron* and *O. ypanemense* show themselves in the damper habitats, but in drier places are sometimes delayed until the heavy rains of June. If moisture is sufficient, the first of these remains in growth as late as December. Larger plants which resemble *O. ellipticum* of the American tropics do not appear until June and have not been collected after August 1; they are perhaps a large variety of *O. dendroneuron*. *O. tenerum* and *O.*

macrorhizum rarely come into growth before June, and are more abundant in late summer and in autumn. *O. mononeuron* is commonly associated with *O. tenerum* in the drier habitats but sometimes appears several weeks earlier. A plant which appears to be specifically different from those mentioned above, and which is apparently undescribed, has been collected several times during the winter months, but as yet its status and life history are undetermined. The rare epiphytic *O.* (*Cheiroglossa*) *palmatum* may be collected in the few remaining stations throughout the year. Most of the new leaves are produced during the rainy season, which ends about September 1, but spores are shed in late winter or spring.

On the basis of preference for particular types of soil the species may be roughly divided into two groups. The larger number are found in the more or less acid soil about the margins of shallow ponds in the low pinewoods ("flatwoods"), or in roadside ditches or shallow excavations where decaying vegetation has washed in, producing similar conditions. In this group belong *O. dendroneuron* and the larger related form, *O. ypanemense*, *O. macrorhizum*, *O. tenerum*, typical *O. crotalophoroides*, and *O. mononeuron*. *O. Engelmanni* and a well-defined subspecies of *O. crotalophoroides* show a strong preference for calcareous soil. *O. floridanum* grows freely in both kinds of soil, but is more frequent and produces larger and denser colonies by vegetative reproduction in calcareous clay or among limestone fragments.

Although prolonged drought brings cessation of growth in all species, the degree of moisture that is required during the active period varies greatly. The plants that prefer acid soil are commonly found in areas that are subject to flooding during the rainy season, sometimes for months at a time; in such places they often

appear sparingly just in advance of the rising waters, but are most abundant as the waters retreat toward the lower ground. *O. tenerum*, *O. mononeuron*, and typical *O. crotalophoroides* are rarely found below high water mark, and commonly grow in openings among the saw palmettos (*Serenoa*) above that level. The calciphilous species occupy drier habitats, but appear earlier in the moister portions.

As a group, Ophioglossums are plants of the open lands. Only *O. Engelmanni*, *O. floridanum*, and the subspecies of *O. crotalophoroides* are frequently found under the shade of trees or shrubs, while the typical *O. crotalophoroides* sometimes seeks the rather dense shade of the shrubby saw palmettos. Most of the others grow among grasses and other moisture-loving plants, but not in turf or under tall weeds. The very small plants of *O. macrorhizum* and *O. mononeuron* are found only in bare ground, in openings among the more robust plants, where they get direct sunlight. *O. tenerum*, which is often little larger, is found in similar situations but does stray into the light shade of taller grasses. These conditions of light and shade sometimes exist only during the relatively brief period when the plants are in active growth.

As is true of the northern Botrychiums, several species of *Ophioglossum* are commonly associated in the same habitat, perhaps because the same species of fungus is able to establish the necessary symbiotic relation with all. Except in case of the plants that require calcareous soil, it is unusual to find one species growing alone. In one especially varied habitat six species have been found within the space of two or three acres. Commonly two or three species inhabit the same area, though they may not all be in growth at the same time. When a colony has been found, the collector will find it wise to note marked variation in the appearance of the plants, and

to search adjacent areas where degrees of shade and moisture are somewhat different.

The Ophioglossaceae are the most primitive of living ferns, and in most respects are poorly equipped to compete with higher plants. Under natural conditions they are widely but very sparingly distributed through central and northern Florida, yet one who studies them in the field soon recognizes adaptations that have enabled them to continue until this time their losing struggle for their place in the sun. They are so small that they can reach mature growth in very limited areas of unoccupied soil. The swollen rootstocks, and in some species the thick and abundant roots, store prepared nourishment; and when a cycle of growth begins, its progress is so rapid that a plant may shed its spores before the coarse grasses about it produce unfavorable shade. The two species that grow on the palmetto plains actually profit by the annual or more frequent burning-over that has long been so destructive of plant life in Florida. The rootstocks are buried so deeply that they are uninjured, whereas larger and stronger competing plants are killed or greatly retarded.

It is a striking fact that in case of several species the plants are rarely collected save in artificial habitats, such as abandoned phosphate mines, excavations made in securing road material, and roadside ditches, although in these places they are often very abundant. Clausen, in his monograph of the Ophioglossaceae (p. 172), suggests that this peculiar distribution, together with the fact that until recently the presence of these plants in Florida has been unknown, may indicate recent introduction. The correct explanation seems to be, however, that these excavations remove the competing plants and at the same time provide exactly the right degree of moisture.

The point is of sufficient interest to warrant elaboration. In the very extensive "flatwoods" or "low pinewoods" of Florida the water table is very high, often within a foot or two of the surface. In grading roads through these regions soil is taken from the occasional low knolls along the right of way. These excavations are carried down to the water level and then abandoned. Within a few years they become ideal habitats for *Ophioglossum*. If there are a few plants in the vicinity, the speed with which their progeny occupy the new habitat is amazing. In one such excavation, the history of which is well known to the writer, a careful estimate based upon numerous measurements and countings showed that six years after the ground was first broken the number of plants of *O. dendroneuron* within an area of one acre was not far from 100,000. Such colonies are sometimes nearly or entirely exterminated within a few years, as the stronger plants come in and renew the competition.

If the writer can be of further service to serious students of these plants who may visit Florida he will be glad to do so, in so far as circumstances permit.

Recent Fern Literature

Hermann Nessel, known for some time as a student of the club-mosses, has published a general treatment[1] of the Lycopodiaceae (except the little Australasian genus *Phylloglossum*), with descriptions of the 700 or so species, varieties, and forms he recognizes and illustrations (chiefly photographs of herbarium specimens) of 89 of them. His ground-plan of classification follows closely that proposed by Herter. He recognizes two genera, *Urostachys* (including, in our flora, *Lycopodium Selago* and *L. lucidulum*) and *Lycopodium* proper (all our

[1] Nessel, H. Die Bärlappgewächse (Lycopodiaceae). Jena, Gustav Fischer, 1939. 404 pp., 89 figs.

species with differentiated fruiting spikes), and a considerable number of subordinate groups under each. His treatment of species, at least those with which I am familiar, is conservative, even conventional; but when he comes to varieties and forms he lets himself go. There are 45 of them under *L. clavatum*, 44 under *L. cernuum*, and lesser but considerable numbers under other species. What we know as *L. tristachyum* he divides between two varieties of *L. complanatum;* and the well-marked American *L. complanatum* var. *flabelliforme* is likewise placed (mistakenly) under two European varieties.

It is a pity that Nessel's work was not better done. The last comprehensive descriptive treatment of Lycopodiaceae was Baker's, in 1887. The family has never had an index like the Index Filicum. A really thorough and accurate revision, with good keys and synonymy which would properly place existing names, as does that in Britton & Rose's Cactaceae for that family, would have had especial value. Nessel falls far short of that. His bibliography and nomenclature are almost unbelievably careless and inaccurate. His keys are badly put together and difficult to follow. His descriptions are better; they make one feel that there is a substratum of genuine knowledge beneath the surface crudities.

Nessel's work is not for the inexperienced; with its blundering technique, it is pretty sure to lead them into confusion and error. But it contains much information, and in the hands of experts may serve as a more or less useful stop-gap until a really adequate monograph of the Lycopodiaceae is written.—C. A. WEATHERBY.

A recent work on plants used in popular medicine in Uruguay mentions five species of ferns so employed. They are: *Polystichum adiantiforme*, "Calaguala"; *Equisetum ramosissimum* (according to Prof. Schaffner's treatment *E. giganteum* would be meant), "Cola de Ca-

ballo''; *Adiantum cuneatum* and *A. Poiretii*, "Culantrillo''; and *Anemia tomentosa*, "Doradilla.'' With the first species, the juice of the fresh root is rubbed on the gums to check loosening of the teeth. In the other cases decoctions are used for a variety of diseases, chiefly of the throat and genito-urinary system.[1]—C. A. WEATHERBY.

Almost since the beginning, the classification of ferns has swung back and forth between the ''lumpers'' and the ''splitters.'' As has been pointed out, recent morphological and phylogenetical investigation, with the emphasis it has placed on characters other than those of fructification on which the more conservative systems were chiefly based, has greatly encouraged the splitters. This has been particularly the case in the Orient, where Japanese and Chinese pteridologists have been busy for some years dividing up families and genera.

With each successive paper from Dr. Ching, some traditional group suffers dissection. In the two latest which have come to our notice, *Christensenia* is separated from Marattiaceae and *Helminthostachys* from Ophioglossaceae and a new family erected for each; and the dismemberment of the tropical genus which we have come to know as *Tectaria* is begun. Dr. Ching restricts this name to the immediate group of its type species, *T. trifoliata*, and revives *Aspidium* for the group of *T. cicutaria*. This is done with no discussion beyond the bare statement that *T. cicutaria* "is hardly congeneric with *Aspidium trifoliatum* (L.) Sw. which I take here as the type of the genus''—a very good example of the method of splitting by the mechanical raising to generic rank of subgenera already defined by others.

Whatever the taxonomic situation, no amount of argument can justify the taking up of *Aspidium*. As de-

[1] González, Mathias, Atilio Lombardo y Aida J. Vallarino. Plantas de la Medicina Vulgar del Uruguay.

limited by its author at the time of publication (1801), it included elements now generally assigned to ten different genera, no less than five of which had already received tenable names—*Oleandra* Cavanilles (1799), *Tectaria* Cav. (1799), *Polystichum* Roth (1799), *Dryopteris* Adanson (1763), and *Athyrium* Roth (1799). *Aspidium,* therefore, is quintuply illegitimate under Article 59(1) of the Rules of Botanical Nomenclature and cannot properly be used for anything. Even if it could, Schott's choice of *A. trifoliatum* as type, made when, with full and careful statement of characters, he divided Swartz's composite genus in 1834, and accepted by Presl (1836), implicitly by most authors since and explicitly by Christensen in the Index Filicum, ought not to be disturbed except for very weighty reasons. If the group of *Tectaria cicutaria* is to be separated off as a genus, *Sagenia* Presl (1836) is the correct name for it; *Aspidium* should be left as an exact synonym of *Tectaria.*[1]—C. A. W.

"Weeds and Weed Seeds," published by the Seed World, Chicago, lists Marsh-fern, Bracken and Horsetail (*Equisetum arvense*) among poisonous plants—poisonous, however, only to grazing animals. Both Bracken and Horsetail have figured in the past in manuals of poisonous plants, but I do not recall having seen Marsh-fern in such company before. It is said to be a contaminant in marsh hay and to cause illness in livestock if present in any considerable quantity. Control by grubbing out rootstocks and draining is recommended—seemingly a great exertion to cure a small evil.—C. A. W.

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[1] Ching, R. C. A new fern family in tropical Asia. **Bull. Fan Mem. Inst. 10**: 227–228. 1941. New family and combinations of ferns. **Op. cit.** 235–256.

American Fern Society

In Horticulture for October 15, 1941, note is taken of the "Field trips to fern gardens" from the FERN JOURNAL, which appeared about September first. Special interest is expressed in the prospective list of a winter season for fern gardens in Florida and other southern states. Horticulture, edited by Mr. E. I. Farrington, has headquarters at Horticultural Hall, Boston, which was the site a score of years ago of what has been probably unique for this country, a large show devoted almost exclusively to ferns. England formerly had many such exhibitions.

MORE TRIPS TO FERN GARDENS.—The note in the last number of the JOURNAL has brought in a good deal of correspondence, as a result of which additional northern gardens will be listed when the season is again favorable for visiting them. One response from Bowman's Hill State Wild Flower Preserve at Washington Crossing Park, Pennsylvania, consists of three bulletins, in which various trails are mentioned. One of these, the "Edgar T. Wherry Trail," has 70 of the 80 species of ferns and fern allies native to Pennsylvania.

Of particular interest at this time are two additional fern gardens in Florida, which may be visited by those who have the good fortune to make a southern trip. The addresses are: Dr. E. L. Dow, 8 Golf View Road, Palm Beach, Florida, and Mrs. E. Peterson, R. D. 3, Box 84, Miami, Florida. Mr. Maurice Broun writes that his return to Florida this winter is at present uncertain. Mrs. Diddell's fern garden, Jacksonville, is in a state of development.

Prospective visitors are requested to inquire in advance as to a convenient time for visits.

THE NEW JERSEY FIELD TRIP.—On the morning of September 28 twelve cars convened at a crossroad near Culver Lake, Sussex County, for the scheduled visit to Bear Swamp, near Lake Owassa. Some 30 members and friends of the Fern Society and of the Torrey Botanical Club, by which organizations the trip was jointly sponsored, foregathered with representatives from Jacksonville, Florida, Washington, D. C., Philadelphia, Lancaster, and Morrisville, Pennsylvania, Rutgers University and other New Jersey habitats, and New York City.

Bear Swamp yielded, without much difficulty or delay, three ferns of interest for this part of the State—the two chain-ferns and the Massachusetts Fern—together with two fall Botrychiums and various species of more common occurrence. With a great deal of difficulty the party then penetrated a sector of rhododendron thicket, from which nothing of filicinean interest was obtained. It may be recalled that the occasion for a visit to this locality was presented in a note in the first issue of the JOURNAL for this year, which dealt with a newspaper report of increased interest in *Osmunda* root-masses and of consequent "mining" for the so-called peat. On this September trip we found plenty of *Osmunda*, but no "fern miners" were seen; nor were any copperheads encountered, poison sumac and poison ivy being the most toxic species met with. Incidentally, another word may be added to the glossary of popular terms applied to *Osmunda* "peat"; natives in Sussex County refer to the individual root masses as "bogs."

Although the Bear Swamp area extends southward nearly two miles into higher wooded ground, it was decided to adjourn to a place of long-proven interest from the fern standpoint—to Springdale, near Newton. Permission was obtained to enter the large woodland, pasture, and swamp area from the owner, Mr. Whittingham.

Here Goldie's and Clinton's ferns with other *Dryopteris* species are abundant, and hybrids between them have been collected during the past 40 years. A large colony of *D. Goldiana* × *marginalis*, first reported from Springdale by Philip Dowell, was visited.

On an earlier Fern Society trip to this locale two plants of Hart's-tongue, taken from one of the spore cultures raised at the Brooklyn Botanic Garden, were installed for naturalization purposes. Leon Bowen had reported finding these in a visit last winter. On this visit they were again located—one in a thrifty condition with nine good-sized leaves (eight of them fertile), the other depauperate. The latter plant was divided into its two constituent crowns and reset. Although soil and rock conditions at Springdale are not dissimilar to those of central New York, where the Hart's-tongue is native, the latter has higher, cooler slopes and declivities. No sign of spore reproduction was observed.—R. C. B.

JOURNAL SETS COMPLETED.—By the recent reprinting of three back numbers which had been entirely exhausted, the Society is again able to supply sets of the JOURNAL from the time of its founding in 1910. With the Wherry 25-year Index and the Blake list of American fern literature as guides, a complete set of this publication will serve as an encyclopedia of fern lore covering their culture, conservation, habitat and distribution, relationship, economic uses, etc. Recent members can benefit both themselves and the Fern Society treasury by ordering. (See cover page 2 for details.)

WINTER MEETING.—A meeting of the American Fern Society will be held at Dallas, Texas, at 10 o'clock on the morning of Thursday, January 1, 1942. All members and their friends are invited to attend. The place is Parlor E in the Adolphus Hotel. Tables will be avail-

able for the display of herbarium specimens, also a lantern for the projection of slides. Bring your specimens and problems to this meeting and become acquainted with your fellow members. Those who may desire to present formal papers should notify R. T. Clausen at the Department of Botany, Cornell University, Ithaca, New York. Indicate the title of your paper and the probable length of time required, also whether or not you will need the use of the lantern. Reservation for accommodations at Dallas should be sent directly to hotels. Headquarters for the Society will be at the Baker Hotel.

MEMBERSHIP COMMITTEE NOTES.—With gratification the Committee calls attention to the long list of new members. For this result many thanks are due to officers and members at large, who cooperated by taking supplies of the special circular made available about August 1. One committee member reports "over 100 letters written," with a distribution of circulars singly and in larger lots. Another member took 50 in a first batch, for individual distribution, and 75 later. The first printing of 1000 circulars having been exhausted, the Committee ordered a second thousand from the original plates. It is expected that many further returns will be received from the invitations already sent out, but it is hoped also that many more members will join the growing Committee. Requests for circulars may be made to the Committee Chairman, Mr. W. Herbert Dole, 23 Overlook Ave., West Orange, N. J., or to the American Fern Society, Brooklyn Botanic Garden. Sample copies of the JOURNAL will be sent out also, when requested.

NEW MEMBERS

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Mrs. Arthur Luhr, 2457 Parker Place, Honolulu, T. H.
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Index to Volume 31

Acrostichum undulatum, 104
Additional forms of ferns in the Kutztown-Fleetwood area, Pa., 73
Adiantum capillus-veneris, 37, 52, 63, 65, 112; cuneatum, 150; Poiretii, 150; pedatum, 65, 67, 68, 69, var. aleuticum, 75; tenerum, 52; Weatherbyanum, 27
Alsophila infesta, 122
American Fern Journal through thirty years, 41
American Fern Society, 29, 77, 118, 152; field trip, New Jersey, 153; meeting at Philadelphia, 37
Anemia adiantifolia, 48, 49; tomentosa, 150
Arizona, Asplenium adiantum-nigrum in, 97
Arkansas, Pteris multifida in, 112; some noteworthy fern communities of, 63
Aspidium trifoliatum, 150; uliginosum, 12, 13, 14
Asplenium adiantum-nigrum in Arizona, 97
Asplenium Bradleyi in Ohio, 21
Asplenium abscissum, 52, 95; adiantum-nigrum, 37, 97; Andrewsii, 99; biscayneanum, 96; Bradleyi, 21, 66, 68; cryptolepis × Camptosorus rhizophyllus, 27; Curtissii, 52, 96; heterochroum, 52; platyneuron, 27, 65, 66, 67, 68, 69, 70, f. furcatum, 73; pumilum, 49; septentrionale, 99; resiliens, 65, 66, 67, 68, 69; thelypteroides β serratum, 60; trichomanes, 65, 66, 68, 69, 99; triphyllum, 116; verecundum, 52, 95
Asplenosorus ebenoides, 38, 70; inexpectatus, 27
Athyrium angustum, 64, 65, 73, var. elatius, 25, var. rubellum, 25; asplenioides, 64, 65, 66, 67, 68, 69, f. subtripinnatum, 63, 65, 67; thelypteroides, 60, 64, f. acrostichoides, 60, f. serratum, 60
Azolla caroliniana, 6

Benedict, R. C. American Fern Journal through thirty years, 41; Charles Alfred Weatherby and the American Fern Journal, 1; ferns in the news, 22; gold rush: a fern ally, 127
Beware of Lycopodium, 100
Blake, S. F. State and local fern floras of the United States, 81, 131
Blechnum serrulatum, 49
Bolbitis nicotianaefolia, 121
Botrychium cicutarium, 29; dissectum, 70, var. tenuifolium, 70; lunaria, 26; matricariaefolium, 21; obliquum var. tenuifolium, 65; pumicola, 38; virginianum, 28, 65, 66, 67, 69
Bracken, 4; as a source of paper in Britain, 112
Brake, ladder, 5; spider, 4
Butters, F. K. Hybrid Woodsias in Minnesota, 15

Calaguala, 149
Camptosorus rhizophyllus, 66, 69
Chandler, Albert. Common Missouri ferns (review), 118; Pteris multifida in Arkansas, 112
Charles Alfred Weatherby and the American Fern Journal, 1
Cheilanthes alabamensis, 65, 70, 112; lanosa, 65, 66, 70; setigera, 12; siliquosa, 27; tomentosa, 65, 66, 70; Wootonii, 99
Ching, R. C. New family and combinations of ferns (review), 151; new fern family in tropical Asia (review), 151
Clausen, R. T. Experiences with ferns in the western United States (review), 37; report of president for 1940, 29
Club-moss, Carolina, 8; Chapman's, 8; foxtail, 8; rock, 9; shining, 9; southern, 9
Cola de caballo, 149
Colorado, sources of the fern flora of, 37
Cryptogramma acrostichoides, 39; crispa, 26, var. acrostichoides, 37
Culantrillo, 150
Cyrtomium falcatum, 50
Cystopteris bulbifera, 66, 68, 69; fragilis, 26, 28, 37, 65, 66, 67, 68, 69, var. Mackayii, 60, var. protrusa, 63, 65

Dennstaedtia punctilobula, 66, 70
Diddell, Mary W. More Florida ferns, 113; new stations for Florida pteridophytes, 48
Diplazium acrostichoides, 64; esculentum, 49; pycnocarpon, 63, 65, 66, 68, 69
Dix, W. L. Report of judge of elections, 35
Dominica, notes on ferns of, 103
Doradilla, 150
Dryopteris augescens, 48, 49; Clintoniana var. australis, 70; cristata, 70; dentata, 50, 121; dominicensis, 122; filix-mas, 99; fragrans var. remotiuscula × spinulosa var. intermedia, 38; Goldiana × marginalis, 151; guadalupensis, 122; hexagonoptera, 65; hydrophila, 122; leucolepis, 13; marginalis, 65, 66, 67, 68, 69, 74, f. Traillae, 61, f. tripinnatifida, 61, 74; normalis, 49; noveboracensis, 65, 70; oligophlebia, 13; ornata, 13, 14; quadrangularis, 121; reptans, 48, 49; rustica, 122;

setigera, 12, 13, 14; simulata, 28; spinulosa, 37, 66, 70, var. fructuosa, 37, var. intermedia, 37, 73; subincisa, 122; tenericaulis, 14; thelypteris, 28, var. pubescens, 62; trichodes, 13; uliginosa, 12, 13, 14, 50, 52
DUNKLE, M. B. Ferns of the Channel Islands (review), 115

Elaphoglossum Boryanum, 104; flaccidum, 104; Gayanum, 115, 116; glabellum, 103; Herminieri, 104; hybridum, 104; Lindenii, 115; Lloydii, 104; Mathewsii, 115, 116; Maxonii, 104; Porteri, 115, 116; rigidum, 104; scolopendrifolium, 105
Equisetum arvense, 70, 129, 130, β granulatum, 61; fluviatile, 28; giganteum, 149; kansanum, 28; laevigatum, 68, 69; palustre, 28; praealtum, 11; ramosissimum, 149; scirpoides β minus, 61; variegatum, 25
ERICKSON, L. C. A study of Isoetes in San Diego County, California (review), 117
EWAN, JOSEPH. Sources of the fern flora of Colorado (review), 37

Factors determining the distribution of Florida ferns, 91
Fern, Christensen's marsh, 5; marsh, 6; New York, 5; water, 6; whisk, 7
Ferns and fern allies of South Carolina, 4
Fern floras, state and local, of the United States (annotated list, alphabetically arranged by states), 81, 131
Ferns in the news, 22
Floras, state and local fern, of the United States, 81, 131
Florida, factors determining the distribution of ferns, 91; more ferns of, 113
FRIESNER, RAY C. Key to species and varieties of ferns and fern allies of northeastern North America (review), 27

Gold rush: a fern ally, 127
Goniopteris reptans, 95
González, Mathias, Atilio Lombardo y Aida J. Vallarino. Plantas de la medicina vulgar del Uruguay (review), 149
Ground pine, 9
GROUT, A. J. Moss flora of North America north of Mexico (review), 116
GRUBER, C. L. Additional forms of ferns in the Kutztown-Fleetwood area, Pa., 73

Habitats and distribution of Ophioglossum in Florida, 143
HARRINGTON, JOHN P. Chainfern and maidenhair, adornment material of northwestern California basketry (review), 75
HASHIMOTO, GORO. Flora Nipponobrasiliensis, I. (review), 29
HODGE, W. H. Notes on Dominica ferns, 103, 121
Horsetail, giant, 11
Hybrid Woodsias in Minnesota, 15
Hymenophyllum ectocarpon, 123, 125; fucoides, 123, 125; hirsutum, 125, 126; lanatum, 125, 126; latifrons, 125, 126, 127

Isoetes Engelmannii, 11, 52, 113, var. caroliniana, 12; flaccida, 52; Howellii, 117, var. minima, 117; melanopoda, 66, 68, 69; Nuttallii, 117; Orcuttii, 117; virginica, 27

KINNEY, C. W. Marginal shield-fern and other ferns in captivity, 74
KITTREDGE, E. M. An Osmunda cinnamomea variant, 71
KOSTER, HOLLIS. New Lycopodium gametophytes from New Jersey, 53

Lastrea marginalis β Traillae, 61; thelypteris β glabra, 61, α pubescens, 62
Lawson's type specimens, 59
Local fern floras of the United States, 81, 131
LOMBARD, LUCINA HAYNES. Up high, 72
LOOSER, GUALTERIO. Botanica miscelanea V (review), 26; el genero Elaphoglossum en Chile (review), 115
Lycopodium, new gametophytes from New Jersey, 53; use as drug, 100
Lycopodium adpressum, 8, 51, 53, 57, 70, f. polyclavatum, 8; alopecuroides, 8, 53, 54, 57; annotinum, 54; carolinianum, 8, 51, 53, 57; cernuum, 54, 149; clavatum, 100, 149; complanatum, 149, var. flabelliforme, 149; flabelliforme, 9; inundatum, 58; lucidulum, 9, 148; obscurum, 9; prostratum, 9; selago, 148, var. patens, 9; tristachyum, 149; volubile, 54
Lygodium japonicum, 49

Marginal shield fern and other ferns in captivity, 74
Marsilea vestita, 70
MATTHEWS, VELMA D. Ferns and fern allies of South Carolina, 4
MOORE, DWIGHT M. Some noteworthy fern communities of Arkansas, 63
More Florida ferns, 113
MORTON, C. V. On the Florida fern known as Dryopteris setigera, 12

Nephrodium marginale f. Traillae, 61, f. tripinnatifidum, 61; tenericaule, 14
NESSEL. H. Die Bärlappgewächse (Lycopodiaceae) (review), 148
New localities for Botrychium matricariaefolium in Maryland, 21
New Lycopodium gametophytes from New Jersey, 53
New stations for Florida pteridophytes, 48
Notes on Dominica ferns, 103, 121
Notholaena dealbata, 70

Obituary. Breckenridge, Lester Paige, 39
Onoclea sensibilis, 65, 66, 67, 68, 69
On the Florida fern known as Dryopteris setigera, 12
Ophioglossum, habitats and distribution of, in Florida, 143
Ophioglossum crotalophoroides, 144, 145, 146; dendroneuron, 144, 145, 148; Engelmannii, 70, 144, 145, 146; floridanum, 48. 95, 144, 145, 146; macrorhizum, 145, 146; mononeuron, 145, 146; palmatum, 39, 145; petiolatum, 48; reticulatum, 103; tenerum, 144, 145, 146; vulgatum, 21, 22, 144; ypanemense, 144, 145
Osmunda cinnamomea variant, 71
Osmunda cinnamomea 22, 65, 67, 68, 69, 72, f. frondosa, 71, 72; Claytoniana, 67, 71; regalis var. spectabilis, 65; spectabilis, 22

Pellaea atropurpurea, 65, 66, 69, 70, f. cristata, 71; glabella, 71; ternifolia, 25
Pennsylvania, recent fern finds (review), 37
Phegopteris hexagonoptera, 66, 67, 68, 69
Phlebodium aureum, 49
Pilularia americana, 71
Pityrogramma Schaffneri, 111
Polypodium asplenifolium, 111; basi-attenuatum, 107, 110; flabelliforme, 105; glaucophyllum, 105; jubaeforme, 111; **Knowltoniorum,** 105, 107, 109, 110, 111; limbatum, 110; nemorale, 14; ornatum, 12; polypodioides, 26, 65, 66, 68, 69, 70; repens, 110; serricula, 107, 109, 110, 111; Sherringii, 107, 110; tenericaule, 14; tenuiculum, 111; trichodes, 13; trichomanoides, 107, 109, 110, 111, virginianum, 67, 68, 69, f. deltoideum, 73
Polystichum acrostichoides, 50, 65, 67, 68, 69, 74, 113, f. crispum, 74; f. incisum, 71, var. incisum, 65, 74; adiantiforme, 149; Braunii var. Purshii, 25, 27; mohrioides, 26
PROCTOR, GEORGE R. Asplenium Bradleyi in Ohio, 21
Protective fern mounts, 114
Psilotum nudum, 7, 51; triquetrum, 7
Pteridium aquilinum, 112; latiusculum, 4, 64, 65, 67, 70, var. pseudocaudatum, 4, 64, 65, 70
Pteris multifida in Arkansas, 112
Pteris cretica, 50, 52; multifida, 4, 112; vittata, 5
Pycnodoria cretica, 50

Quillwort, Appalachian, 11

Recent fern literature, 24, 75, 115, 148
Report, editorial, 35; of judge of elections, 35; of president, 29; of secretary, 31; of treasurer, 33
Reviews: Chandler, Albert. Common Missouri ferns, 118; Ching, R. C. New fern family in tropical Asia, 151, New family and combinations of ferns, 151; Dunkle, M. B. Ferns of the Channel Islands, 115; Erickson, Louis C. Study of Isoetes in San Diego County, California, 117; Friesner, Ray C. Key to species and varieties of ferns and fern allies of northeastern North America, 27; González, Mathias, Atilio Lombardo y Aida J. Vallarino. Plantas de la medicina vulgar del Uruguay, 149; Grout, A. J. Moss flora of North America north of Mexico, 116; Hashimoto, Goro. Flora Nippobrasiliensis I, 29; Looser, Gualterio. Botanica Miscelanea V, 26, El genero Elaphoglossum en Chile, 115; Nessel, H. Die Bärlappgewächse (Lycopodiaceae), 148; Tryon, R. M. Jr. Ferns and fern allies of Wisconsin, 24
Running pine, 9

Saccoloma domingense, 123; inaequale, 123
Salvinia rotundifolia, 50
Selaginella acanthonota, 10; apoda, 10, 51, 65, 67, 68, 69, 113; arenicola, 51; ludoviciana, 51; rupestris, 11, 68, 69; tortipila, 11
Selaginella, creeping, 10; rock, 11; sand, 10; southern rock, 11
Some noteworthy fern communities of Arkansas, 63
South Carolina, ferns and fern allies, 4
SPURR, STEPHEN H. Factors determining the distribution of Florida ferns, 91
State and local fern floras of the United States, 81, 131
ST. JOHN, EDWARD P. Habitats and distribution of Ophioglossum in Florida, 143

SVENSON, HENRY K. Report of the treasurer for 1940, 33

Tectaria cicutaria, 150, 151; trifoliata, 150
Thelypteris macilenta, 95; normalis, 5; noveboracensis, 5; palustris, 6, var. pubescens, 62; uliginosa, 14
Trichomanes hymenoides, 123; punctatum, 123; sphenoides, 123
TRYON, R. M. JR. Bracken as a source of paper in Britain, 112; fern collecting in Wisconsin (review), 38; ferns and fern allies of Wisconsin (review), 24

Up high, 72

WAGNER, W. HERBERT, JR. New localities for Botrychium matricariaefolium in Maryland, 21
WEATHERBY, C. A. Editorial report, 1915–1940, 35; Lawson's type specimens, 59; protective fern mounts, 114
WHERRY, EDGAR T. Asplenium adiantum-nigrum in Arizona, 97; recent Pennsylvania fern finds (review), 37
WHITEBREAD, CHARLES. Beware of Lycopodium, 100
WHITNEY, ELSIE GIBSON. Report of the secretary for 1940, 31
Woodsia **Abbeae,** 18; alpina, 15, 16, 17, 62, ×ilvensis, 15; Cathcartiana, 15, 18, 19, 20, ×ilvensis, 18; glabella, 15, β Belli, 62; **gracilis,** 15, 19; hyperborea, 17; ilvensis, 15, 16, 17, 18, 19, 20, 62, β gracilis, 15, 17, 62; laetivirens, 62; obtusa, 6, 15, 65, 67, 70; oregana, 19; scopulina, 15, 19, 20, 66, 67, 71
Woodsia, blunt-lobed, 6
Woodwardia areolata, 65; fimbriata, 75

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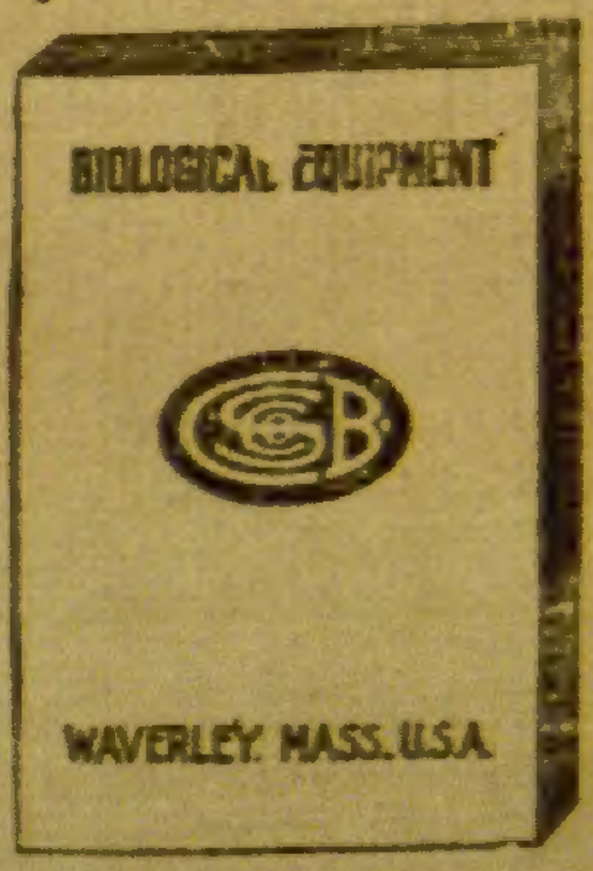

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